ELECTRICAL REVIEW

23rd MAY, 1952

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Generating Plant and Coal

STUDY of the table of power station fuel efficiencies published by us on 9th May shows that future requirements of coal for generating electricity have been greatly over-estimated in some recent statements. This table reveals the wide gap in thermal efficiency between the modern stations at the head of the list and the average for the whole country. Had all stations achieved the same high standard about a third more kWh could have been produced for the same consumption of coal. Approximately one-fifth of the total kW capacity is obsolescent and is run only because the installation of new plant has not kept pace with the rapidly expanding demand for electricity.

Further, the influence of such technical advances as the higher steam conditions and unit operation arranged for in the present B.E.A. programme of plant construction is not yet pronounced, and the expectation of increasing the average thermal efficiency from 21·79 to 26 per cent in 1960 seems conservative. While it is not to be expected that history will repeat itself to the extent of making one pound of coal in modern stations do the work of the three and a half pounds required on an average to generate a kWh thirty years ago, there is no doubt that improved heat cycles (largely resulting from metallurgical research), with or without gas turbines, will lead to progressive fuel savings of considerable magnitude. Reports from the United States refer to the attainment of 37·5 per cent thermal efficiency (over what period is not clear). Probably this achievement is in part due to the use of coal of better quality than is British practice, which is to burn the inferior and fine coals that form an increasing proportion of the tonnage mined. This trend will be amplified when arrangements with the National Coal Board for burning such hitherto waste matter as colliery slurry have been implemented. The export of coal may well be an even more urgent necessity in a few years' time. While the electricity supply industry cannot, through its savings in the consumption of

low-grade slack coal, contribute directly to export needs, it can through a greater use of its product at home enable better fuels to be released for sending abroad. If only for this the use of electricity should be encouraged by facilitating the installation of modern generating plant and by fixing prices for coal that bear a proper relation to its heat content.

AT THE B.I.F.

Official assessments of the results of the British Industries Fair usually lean towards optimism. This year, the Board of Trade admits, there was *not* a record attendance but there were more "serious" buyers. The experience of electrical exhibitors was naturally of a mixed character, as in previous years. Some seem to be satisfied with the results or with the prospects; others are inclined to question whether their efforts were worth while. In so far as it is possible to generalize we have the impression that the first week at Castle Bromwich was very slack but after that there was a perceptible rise in tempo and a corresponding brightening among exhibitors. The value of the Fair to the industry will continue to be debated but the conclusion must be reached that this country cannot afford to neglect means of increasing trade successfully used by its competitors.

ENGINEERING EXPORTS

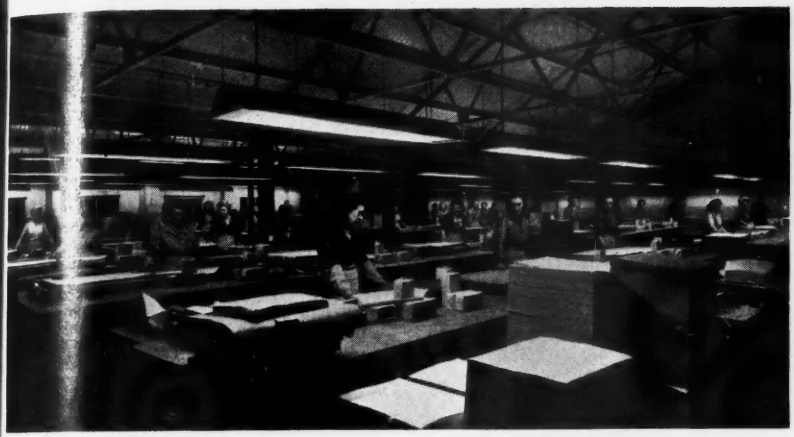
A somewhat gloomy view of the prospects for engineering exports was taken by Mr. Alan Good, managing director of the Brush-Aboe group, in London last week. Mr. Good doubted whether the engineering industry could contribute much more to the closing of the trade "gap." Many overseas markets were more or less saturated so far as consumer goods were concerned and he thought that this might spread to capital equipment. He did consider, however, that the situation could be improved if British exporters were enabled to give overseas customers longer credit and he also thought that a more liberal approach to the subject of depreciation of plant and equipment would be helpful.

DILUTION

It is one of the Government's aims to divert people from the less-essential industries to those which are engaged in rearmament and export, predominantly the engineering industries. This involves a number of very difficult problems such as the housing of workers moved from one district to another, their training in entirely unfamiliar work and the attitude of the trade unions. "Dilution" arrangements have existed in the engineering industry since 1939 when it was decided that unskilled entrants should be "vetted" by a national committee representative of employers and the union. Later, to facilitate matters, local "vetting" was allowed but it is said that the system has become lax. Consequently at its meeting last week the National Committee of the Amalgamated Engineering Union decided to press for a reversion to the 1939 arrangements.

I.E.E. SUBSCRIPTIONS

Annual fees for membership of the Institution of Electrical Engineers were among the very few personal expenses that remained the same after the second world war as they were before the first. Growth of membership and sound economy in management no doubt accounted for this happy state, which continued until 1948 when subscription rates had to be raised by about 19 per cent. Since then the costs have risen by 25 per cent which resulted in an Institution revenue deficit for 1951 of £5,726. The further increase in rates, typified by the proposed advance for full members of 15s to £5 15s, should leave a reasonable margin for future contingencies.



Paper Mill Lighting

Good Illumination Essential for High Quality Production

By W. H. DODGSON*

FEW factories of any kind are fortunate enough to have adequate natural lighting for all purposes, even on bright days, and for any continuous process, such as paper making, good artificial lighting is essential for effective and safe running. Most of the older paper mills are of three storeys, the raw materials commencing their initial processing on the top floor and gravitating, process by process, to the lowest level. These multiple storey buildings get natural light through windows set in the outside walls, but even during hours of daylight extensive artificial lighting is necessary. Most of the motive units, power lines, storage tanks and stuff chests, which are situated below ground level, rely on artificial lighting entirely.

Much of the machinery is massive and intricate, requiring fine adjustment and constant attention. The paper is produced at great speed and a short period of inattention at a time of breakdown, or during any irregularity in the working of the machinery, would result in considerable spoilage of material. Good lighting is needed to ensure easy and accurate control. The following account of lighting for paper-making processes shows how important this consideration is.

The description and most of the illustrations are based on the operations and equipment of Jas. Cropper & Co., Ltd., Burneside Mills, Kendal, which is one of the oldest paper-making firms in the industry. The original mill was laid down about 112 years ago and paper is processed in all its stages from raw material to the finished article.

The lighting in the mill was by gas until about 25 years ago, when the mill was completely converted to lighting by electricity. Recently, when considering a complete relighting scheme, tests and a trial installation were carried out to decide on the most suitable light source. It was finally decided that the elongated light

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General view of the " Salle " in which sheets of paper are inspected, sorted and counted

Fig. 1.—Top loft where raw materials are digested by boiling

source and improved colour spectrum undoubtedly made the fluorescent lamp more suitable for the bleaching and beating floors, the machine room and the cutting and finishing departments. Tungsten filament lighting might have served in other parts of the mill, but in view of the almost continuous use of artificial light it was felt that the lesser electricity consumption and the smaller cable sizes necessary justified using fluorescent light throughout the mill despite the increased capital cost involved. It was also felt that any distinction between the lighting in different sections of the mill might have an adverse psychological effect on the workpeople as experience has proved in other installations that, even though two sections have the same level of illumination, the workers under tungsten filament lamps tend to feel themselves at a disadvantage.

Approximately 700 fittings have been used for the complete installation, principally single and twin lamps in standard metal troughs fitted with 5ft 80 W fluorescent tubular lamps.

A considerable amount of preparation is necessary before the material reaches the actual paper-making machine and all preparatory and ancillary parts of the mill require adequate lighting. In the stock shed where there are large amounts of rags, grass, pulp, and waste paper 6 lumens/sq ft is sufficient for the work carried on. Lighting fittings should be mounted above roof truss level to ensure that the highest stacking does not obscure the light or, in the extreme, bring these combustible materials too near to the lamps.

Soda recovery, bleach-making and size-making plants are generally situated on the fringe of the mill and 6 to 8 lumens/sq ft is satisfactory, care being taken to select suitable fittings adequately protected from the action of the chemicals; any non-ferrous parts should be treated with an acid resisting paint.

In a mill using rags the sorting of this raw material is almost as important as the sorting of the finished article. Impurities, such as rubber, would ruin much valuable paper as subsequent operations cannot eliminate them; only good eyesight assisted by good lighting can detect them at this initial stage. The majority of mills use a proportion of salvaged waste paper and practically every consignment contains contraries which lower the quality of high grade paper, so careful selection must be made at this stage.

The first stage of actual paper-making commences in the top, or boiler, loft (Fig. 1) where rags, straw and esparto grass are boiled and then rated visually for their condition, cleanliness and colour; frequently spot adjustments in the cooking and washing operations have to be made. Chemical tests and mechanical aids cannot be used to determine correct condition and therefore everything depends on the eye and

experience of the operator. Normally these areas are largely obstructed by large bales of materials, so good general lighting of the order of 10 lumens/sq ft is required. After boiling in the digestors the material is fed to the kollergangs (Fig. 2) which are constantly revolving heavy wheels grinding and crushing the material until it is ready for dispatch to the beater house where final preparations of the material are carried out before it is sent to the machine house. In no part of the mill is good lighting more desirable, and this is particularly true in the case of the " colour " mill. The colouring of the pulp which takes place at this stage is subject to many variables that may cause differences in the depth or hue. These differences appear in the paper and, although they may be only slight, they may cause it to be rejected. In good daylight the differences are readily detected, but in poor daylight, or under tungsten light, they may pass unobserved until the paper is compared with the colour pattern under a colour-matching lamp; thus before adjustments can be effected a considerable quantity of the paper may have been made. In this section of the mill the illumination is 15 lumens/sq ft and the fittings are mounted over the most important points (Fig. 3) with especial care to maintain an even value of illumination.

The modern paper-making machine consists of a series of parts, each having a separate function, but all interlinked to convert the milk-like " stock " into finished paper. Each moving part is synchronized to ensure both smooth and continuous running, while operational adjustments are of a fine order.

While the controls are situated at the most convenient points, some of the effects can be observed only by close inspection. The function of the machine is to abstract the water from the stock and to form the latter into a sheet. This operation is done on the " wet-end " section (Fig. 4) consisting of an endless wire mesh band supported on rolls, which allows the water to drain through it. About two thirds of the way along its length are suction boxes which remove more of the water. Finally the band passes over a suction roll and the sheet can now be recognized as paper though it still has a water content of 80 per cent. The correct formation on this wire mesh is confined to such close limits that only the experienced operative, or the trained observer, can detect malformation

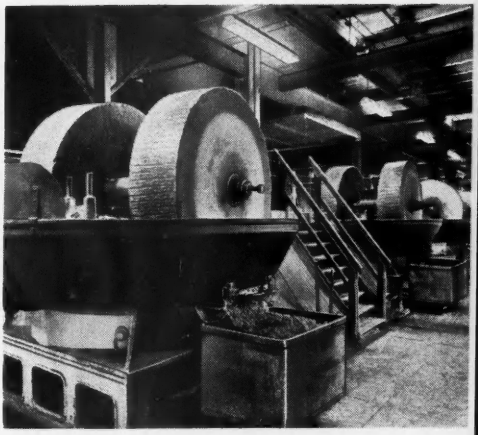
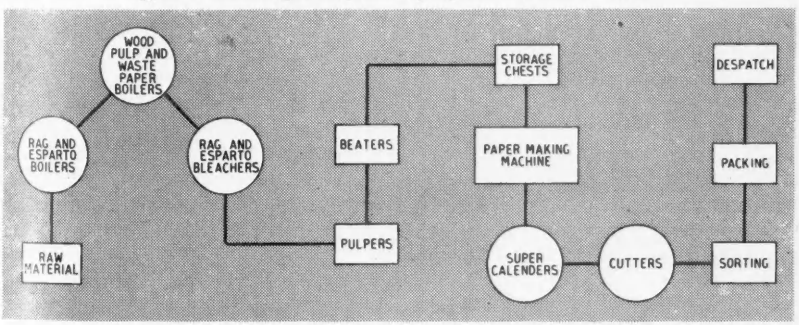


Fig. 2.—Kollergangs for crushing and grinding the boiled materials

Typical flow-line diagram of processing sequence in paper-making mill



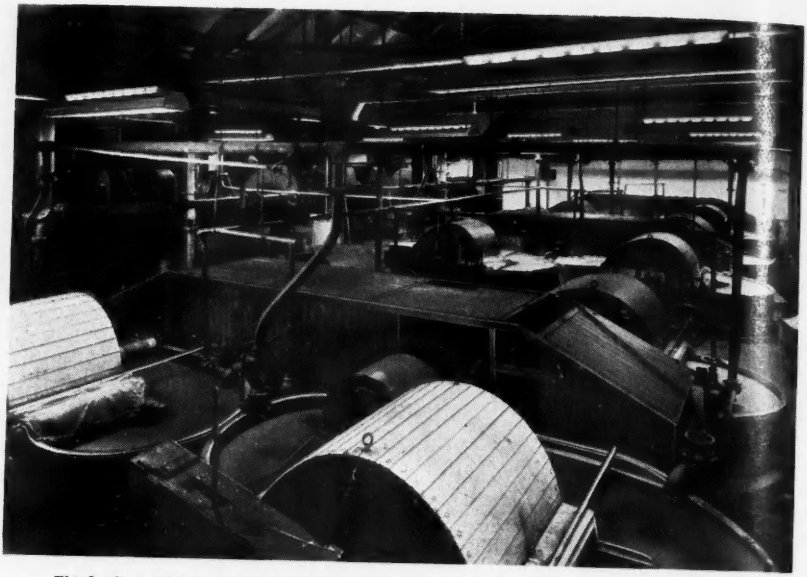
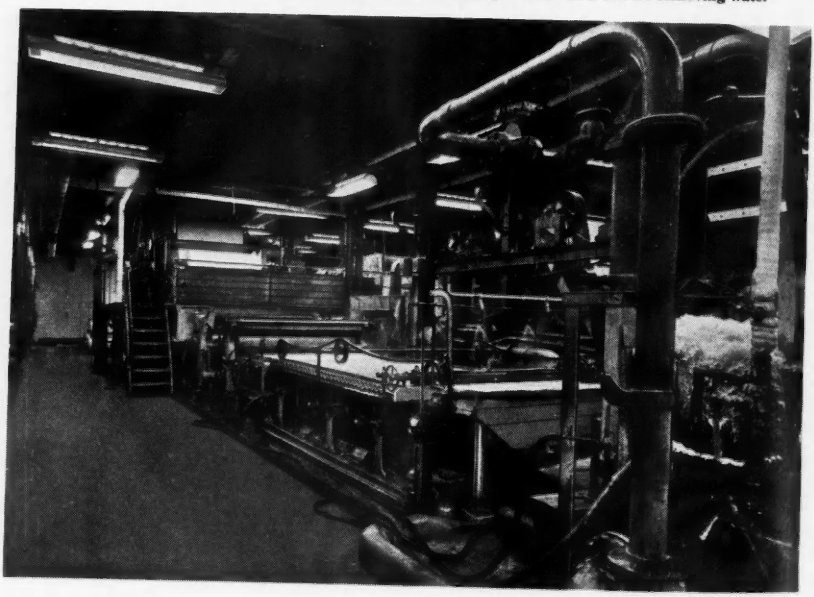


Fig. 3.—Beater house in which materials are finally prepared for the paper-making machines

Fig. 4.—The wet end of the paper-making machine showing suction roll boxes for removing water



and the age of the machine where it arises. The wire mesh itself is a delicate and costly fabric demanding vigilant attention for the slightest deviation in running could, in a few minutes, damage it irreparably. The running of the wet "felts" on the presses as well as the dry felts on the drying cylinders must also be closely watched for the same reason.

Some of these positions on the machine where good light is essential for close observation are listed below:—

The slice	for regulating the flow of the stock on the wire.
The suction boxes	for regulating the extraction of water from the web.
The dandy roll	for ensuring correct water-marking of the paper.
The presses	for regulating the extrusion of water from the web and for regulating the tension of the paper draws from one part to the next to prevent creasing or rupturing of the web.
The drying cylinders	for ensuring that the drying of the paper is progressive and uniform.
The calenders	for ensuring freedom from creasing, piping and surface blemish.

Numerous paper defects occur at the machine: wire spots, holes, froth marks, dandy lifting, picking, belling, coucher crushing and padding, wet felt rubbing, wrinkling and cockling, damp and rusty streaks in drying, all are subject to visual detection. Good lighting is therefore one of the best aids the machine-tender can have to assist him to remedy these defects as they arise.

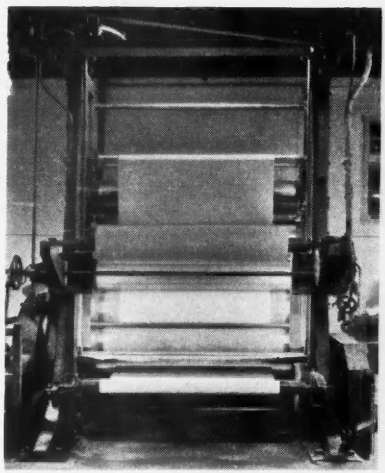
From Fig. 4 will be noted the wet conditions, the bad reflection factor and multiplicity of overhead obstructions; in preparing a lighting scheme all these factors must be taken into consideration. For instance, it is important that lighting fittings should not be mounted directly over the wet end of the machine, as in the humid atmosphere condensation occurs on the metal surface of the units and the consequent drops of moisture falling on the paper would create blemishes and lower the value of the whole roll.

The machine shown has a general illumination of 10 lumens/sq ft with 12 lumens/sq ft over the wire. Fluorescent lighting, carefully sited, not only provides good general light but the elongated light source does not cause harsh shadow and improves visibility between the cylinders without the use of local lighting points.

Papers requiring a higher finish or glaze than that obtainable from the ordinary machine calenders are first surface-damped and then rolled in a specially designed stack of calenders. The damping, which is applied in the form of a fine water spray, must be absolutely uniform because variation of the moisture content across the sheet is liable to cause damp streaks and unequal calliper of the paper after super-calendering. In the damping operation the amount of water being sprayed on the paper is judged visually across the web so here also good light is essential. It is equally important at the next stage, when the paper passes through the calender rolls where it is liable to develop creases if the tension is too slack and piping if the tension is too tight. These defects are of small dimension and with the calender running at speeds up to 1,000ft/min are difficult to detect on the run, while after the paper has been run off they cannot be rectified.

In the super-calender operation room (Fig. 5) the general illumination is 12 lumens/sq ft but on this machine the roll of paper formed an obstruction to top light, so further additional build up of illumination was required on the edges of the paper passing over the centre rolls. This was adequately provided by mounting a 3ft 30 W fluorescent fitting on each side of the frame. Angle reflectors were attached

Fig. 5.—A super-calender for surface finishing at high speed



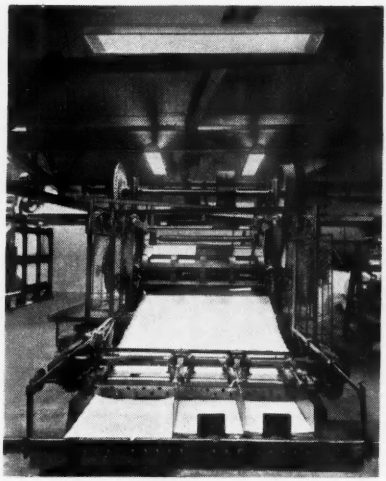


Fig. 6.—Duplex cutter for slitting and trimming the paper

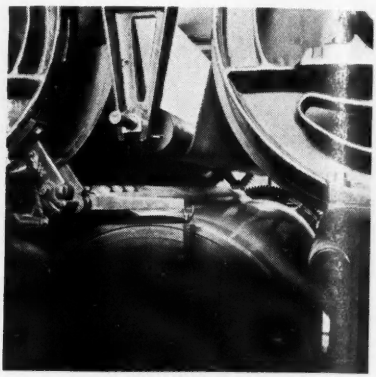


Fig. 7.—Good visibility is essential between the 8ft wide cylinders of the paster machine

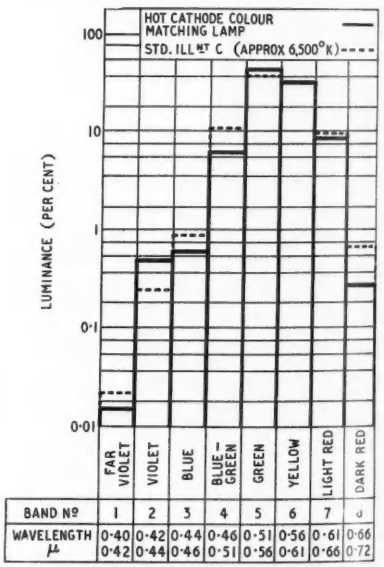
to shield the eyes of the operator from direct light. The results are excellent, high intensity light, free from glare, being provided on the edges of the paper, the values are:—

Vertical illumination at the edge of the paper	60 lumens/sq ft.
Horizontal illumination at the edge of the paper	25 lumens/sq ft.
Vertical illumination at the centre of the paper	10 lumens/sq ft.
Horizontal illumination at the centre of the paper	10 lumens/sq ft.

From the calenders the paper passes to the machines which slit, cut and trim it. Fig. 6 shows a duplex cutter. Good light is required at the centre of such a machine, where the cutters are set to cut the sizes required; here an illumination of 18 lumens/sq ft is provided. When cut, the paper runs into the self layer shown in the foreground and as the quantity of cut paper increases the machine automatically rises to accommodate the paper in its piles. General illumination of 10 lumens/sq ft is adequate for this area.

The paster machine, as the name implies, pastes two sheets of paper together with the glaze on the outside. It consists of cylinders some 8ft in width, illuminated from each side by means of 5ft 80 W angle-type fluorescent fittings mounted on the wall 9ft 6in above ground level, which throw the light down and outwards at 45 deg and provide general illumination around the paster of 8 lumens/sq ft. Fig. 7 illustrates how the light penetrates between the cylinders to improve visibility by

Fig. 8.—Comparison of Metrovick hot-cathode 80 W fluorescent colour-matching lamp with equivalent "north daylight"



virtue of the absence of harsh shadow and it shows how clearly the paper can be seen and malformation detected, and shows in clear detail the condition of the felts.

The "salle" is a paper mill term for the room in which sheets of paper are inspected, sorted and counted. "Sorting" is the mill term for picking out sheets that are visibly defective or that in some other way do not conform to the normal or specified standard. The sorters work at amazing speed rejecting, without hesitation, sheets on which the untrained observer can see no blemish. Failure on the part of the sorter to eliminate defective paper may result in complaints and the rejection of the consignment, possibly even involving the paper maker in an indemnity to the converter for loss of time and materials, or for damage to machines, such as printing presses. Fluorescent lighting has become almost standard for such an area and the photograph on the opening page shows a salle at Alex. Pirie & Co., Ltd., Ford Paper Mills, Sunderland, with an illumination of 25 lumens/sq ft, which is the value recommended for such an area.

In the paper mill laboratory, even more than in the mill itself, lighting must permit accurate colour matching and blending and it is essential that the laboratory should be equipped throughout with colour-matching fluorescent lamps.

It is to be hoped that the paper industry will eventually standardize on some such test light. Up to the present the paper makers, converters, wholesalers and retailers match samples of paper under different conditions, some by daylight, some by blended tungsten/discharge lighting, some by tungsten lamps with colour filters and others by corrected fluorescent lamps, which variety of light sources tends to cause discontent and confusion when samples are placed against the finished product.

For colour-matching purposes employing natural daylight it is generally the practice to work under north skylight and a colour temperature of 6,500 deg K is generally regarded as corresponding to these conditions. Fig. 8 shows how closely a "Metrovick" hot-cathode colour-matching 80 W fluorescent lamp approximates to this standard.

Acknowledgment is made to Mr. J. F. Hill, chief engineer of Jas. Cropper & Co., Ltd., for assistance in the preparation of this article.

Codes of Practice

Impulse Clock and Timing Systems : Bell and Call Systems

THE Council for Codes of Practice for Buildings has just issued in final form Code 327.403 (1952), "Impulse Clock and Timing Systems," which was drawn up by a committee convened on behalf of the Council by the Institution of Electrical Engineers, the present Code being a revision of the draft previously issued for comment.

The Code is part of the series dealing with telecommunication services in the group of codes on electrical installations in and about buildings. It deals with the design and installation of impulse controlled clock and timing systems for various types of premises and provides for visual or audible time indication, means of time recording, or any desired combination of these facilities. Advice is given on the necessary consultation at the planning stage and on the choice of materials, appliances and components together with recommendations regarding the design of various types of systems, methods of wiring and power supply and on the provision of structural accommodation for the equipment and wiring. Sections on inspection and testing and on maintenance are included.

Another Code issued in final form is 327.401 (1952), "Bell and Call Systems." It was originally drawn up by a committee convened by the I.E.E. and the present Code is a revision of the draft previously issued for comment. It deals with the installation in private dwellings, hotels, schools, factories, etc., of bell and indicator call systems, including time bells, burglar alarms and watchmen's supervisory services.

Advice is given on the necessary consultation at the planning stage and on the choice of materials, appliances and components. Recommendations follow regarding the design of various types of systems, methods of wiring and power supplies, and on the provision of the necessary structural accommodation for the equipment and wiring. Sections on inspection and testing and on maintenance are included and there is an appendix giving details of special types of cable.

Copies of these publications are available from the British Standards Institution, 24–28, Victoria Street, London, S.W.1, price 3s post free.

ELECTRICAL RESEARCH

Recent Publications of the E.R.A.

AMONG the latest publications to be issued by the British Electrical and Allied Industries Research Association (available at the prices quoted from the Association at Thorncroft Manor, Dorking Road, Leatherhead, Surrey) are the following:—

A simple method of measuring the axial forces upon windings and individual coils of power transformers having windings of the concentric type is described in Report Ref. Q/T113, "The Measurement of Axial Magnetic Forces in Transformer Windings," by M. Waters, B.Sc., A.M.I.E.E. (12s). The method is suitable for the normal test-room and, so far as the outer winding is concerned, can be carried out very rapidly during a short-circuit test at rated current or less, by taking a series of voltmeter readings; no special apparatus or connections are required.

If the forces on the inner windings are required it is usually necessary to make some special connections to the turns of this winding, so that in this case the method cannot easily be applied without having to dismantle the transformer to remove these connections. There is, however, a simple relationship between the forces in the two windings, and except in special cases, tests on the outer winding should be sufficient for design purposes.

Formulæ Conversion

For many years it will remain necessary to use simultaneously sources of literature written in a variety of electrical systems. The main problem is not the one usually mentioned of converting the respective units but of converting the formulæ and relations holding in one system into those of a different system. Report Ref. L/T261 "Transcription of Electrodynamic Relations into Different Systems" (7s 6d) is one proposal for making this easier.

The dielectric properties of certain benzene derivatives in the solid state are discussed by A. Turney in Report Ref. L/T226 (4s 6d). The dielectric properties of a benzene derivative, namely, pentachlorotoluene, have been measured at 20 deg C over the frequency range 10^4 to $4{\cdot}8 \times 10^{10}$ c/s. The substance exhibits anomalous dispersion and absorption at the lower frequency end of this range which is closely represented in terms of a single dipolar relaxation time. The primary purpose of the measurements was the search for a possible resonance absorption at centimetre wavelengths, but no evidence of such an absorption has been found. A few measurements at centimetre wavelengths have also been made on a second benzene derivative, tri-chloro-pseudo-cumene, but with a similar negative result in the latter connection.

Report Ref. Q/T115 "The Calculation of Transformer Thermal Data from Readings Taken in Service," by M. R. Dickson, B.Sc. (Eng.) (7s 6d), gives details of methods by which all essential thermal data of a transformer or other electrical machine can be calculated, to a satisfactory degree of accuracy, without the necessity for removing the machine from service. Calculations are made from portions of the loading and temperature curves and are given to illustrate the working required.

Fuse Operation

Report Ref. G/T246 "Calculated Curves of Inductive Energy at the Start of Arcing in Fuses," by H. W. Baxter, B.Sc. (Eng.), A.M.I.E.E. (12s), is a further report in the series dealing with fundamental principles of fuse operation, the preceding report being Ref. G/T245. It contains an account of the method of calculation used in preparing curves to show in given cases the prospective current at which the inductive energy in the circuit is a maximum.

An investigation which has been made in an endeavour to develop methods of test for impregnating varnish is described in Report Ref. A/T124 by H. R. Heap, B.Sc. (21s). The report gives an account of experiments on the suitability of a test specimen consisting of a standard test coil which can be impregnated by a standard procedure. The advantages and disadvantages of the proposed test method are carefully weighed.

I.E.S. Summer Meeting

Opening Proceedings at Eastbourne

SOME three hundred members with their ladies and guests assembled in Eastbourne this week for the third summer meeting of the Illuminating Engineering Society which, in addition to the technical sessions, included a number of pleasing social events. This welcome exchange of Yorkshire moors and Derbyshire dales for the sea and Sussex Downs provided the first opportunity for arranging this gathering in the vicinity of London and it thus afforded the so-called metropolitan area Fellows and members a convenient opportunity to support the meeting more fully.

After registration preliminaries at the Grand Hotel (headquarters), activities commenced in earnest with a civic reception at the Winter Garden on the first, Tuesday, evening, followed by dancing, with many opportunities of renewing old acquaintanceships and the making of new friends. The proceedings were opened next morning by the Mayor of Eastbourne who was followed by Dr. W. S. Stiles (N.P.L.) who described what "brightness engineering," in which so much interest is being evinced just now, really is and its role in vision in order to inquire whether the properties of the eye suggest that any limitation of brightness ratios may be desirable for the specification of illumination requirements. Meanwhile, those ladies who wished to do so attended a reception at the Devonshire Lawns Restaurant.

During the afternoon Mr. H. L. Logan (America) discussed criteria for artificial illumination derived from a study of the distribution of light in optimum natural fields of view and explained the use of such criteria in practical design procedure. Members and their ladies were then conveyed by road to the Glyndebourne Opera House, near Lewes*—that attractive country house with its own small theatre beside it in ornamental grounds—a delightful setting for "the smallest of the great opera-houses of the world" in the shadow of the Sussex Downs.

Mr. J. G. Holmes, President of the Society

The second morning commenced with a paper by Messrs. W. D. Chesterman (Royal Naval Scientific Service) and J. B. Collins (Building Research Station, D.S.I.R.) in which was described the solution of problems encountered in underwater lighting for the taking of cinema films in the sea. The first part of the second afternoon was occupied with the short formal business of the annual general meeting of the Society. That was immediately followed by an address by Mr. L. C. Kalff (Eindhoven, Holland) which was entitled "Comfortable Lighting" and gave some particulars of interior illumination developments in the Netherlands. He maintained that to attain to the comfortable state one must approach the indoor lighting problem as much from the artist's standpoint as from that of the engineer or physicist.

The evening reception by the president, Mr. J. G. Holmes (Holophane, Ltd.) preceded a dinner-dance at the Grand Hotel, this being a reversion to the arrangement at Harrogate, four years ago, in preference to the buffet-dance which was held at Buxton in 1950.

This (Friday) morning there is to be a paper by Mr. A. Pott (Architects and Building Branch, Ministry of Education) dealing with artificial lighting from the architectural point of view in relation to the design of schools. The afternoon's paper by Mr. L. H. Hubble (B.T.H.) will record major developments in interior lighting equipment and in so doing will give an indication of the direction in

* *Electrical Review*, 15th July, 1938, page 93.

which future development is most likely to move.

The week's events include a golf competition for the Dow Cup which will be played over the course of the Royal Eastbourne Golf Club on the Stableford system. The proceeds of the competition will be allocated to the Electrical Industries Benevolent Association and the Institution of Gas Engineers' Benevolent Fund.

More detailed summaries of the papers which were presented and of the ensuing discussions will be reported in our next week's issue.

HIGHLAND POWER

North of Scotland Board's Report

LAST year the North of Scotland Hydro-Electric Board generated 1,081 million kWh, of which it sold 235 million in bulk to the British Electricity Authority. These figures compare with 878 million kWh generated and 136 million sold to the B.E.A. in 1951. In its largely rural area the Board connected 18,861 additional consumers, making 263,175 at the end of December last, and incurred capital expenditure amounting to £11·4 million in carrying out its extensive programme of construction and distribution.

Since 1949 the installed capacity of the Board's generating stations has more than doubled, increasing from 251 to 538·5 MW, the latter figure including 367·5 MW of hydro-electric plant. Table 1 gives the chief water-power stations in operation and Table 2 those being constructed or surveyed, from which it will be seen that the whole programme envisages a total capacity of 1,097·6 MW with an estimated annual output of 3,233 million kWh.

Table 1.—Principal Hydro-Electric Plant in Operation

Station and Gross Head (ft)	Plant in Operation MW	Est. Av. Annual Output Mill. kWh
Clunie, 173	61·2	143
Fasnakyle (part for part of year), 522	44	200
Grudie Bridge, 537	24	56
Pitlochry, 50	15	54
Rannoch, 512	48	171
Sloy (catchment incomplete), 910	130	105
Tummel Bridge, 173	34	113
Others*	11·3	31·6
Total	367·5	873·6

* Brodick, Bught (Inverness), Gairloch, part, Inshes (Inverness), Conon Falls, Morar, Nostie Bridge, Striven (Cowal), part, and Tobermory.

In July last year the first 22 MW turbo-alternator at the Fasnakyle power station (Affric Scheme) was commissioned, the second in October, and the third was ready for test at the end of the year. Generation began at Striven (Cowal Scheme) in October. At Gairloch the first set was started up in the early summer, the second underwent tests later in the year and, in view of the demand, a third set was ordered.

Substitute Materials

In carrying out its constructional works the Board has endeavoured both to conserve scarce raw materials and economize in cost. At Affric, Shira, Errochty and the Garry and Moriston stations steel is being saved by substituting underground pressure tunnels for pipe-lines running down the hillside. Local stone is taking the place of bricks, cement and steel for much of the work and an important saving of cement is being achieved by adopting rockfill and moraine-fill dams at favourable sites. At the present time the use of finely ground blast furnace slag for a proportion of the cement in concrete is being tried at the Cluanie (Moriston) dam.

Besides hydro-electric power, interesting developments are in hand in thermal generation. At Carolina Port, Dundee, good progress has been made in the installation of a 12·5 MW closed cycle gas turbine. Experiments have also been sponsored by the Board in running a gas turbine on powdered dried peat and this was tried successfully on John Brown & Co.'s experimental 500 kW gas turbine in December. Researches are being carried out by the Ministry of Fuel and Power and

the Department of Agriculture for Scotland with the object of solving the problem of drying the large quantities of peat required for power production. Attempts to dewater peat and diatomite by electro-osmosis at the Dundee laboratory have so far not produced commercially satisfactory results. Referring to the experimental 100 kW windmill on Costa Hill, the report says that some modifications of the governor gear were found to be desirable. Measurements of wind velocity maintained by the E.R.A. showed that in a gale last January the recorder went off the scale at 127 m.p.h.

The relatively efficient large stations at Aberdeen and Dundee produced most of the 318 million kWh generated by steam power and the cost of £949,816 worked out at 0·72d/kWh, including interest and depreciation charges but excluding rates and management costs. At diesel stations, 55·9 million kWh was generated at a cost of £400,009, equal to 1·72d/kWh. Compared with this, the 702·3 million kWh generated by water power cost £1,067,062, or 0·36d/kWh. Some of the hydro-electric plant was built before the war when the cost of construction was, of course, very much less than it is to-day, but even at present-day prices hydro-electric production costs are less than half those for diesel generation.

New consumers connected last year included 13,700 in rural areas, one of the Board's chief aims being to supply the agricultural population as quickly as possible. During the year 115 villages, hamlets and new housing areas were connected to the mains and 21,931 consumers were changed over from d.c. to a.c.

Of the 916 million kWh sold (average price, 1·29d/kWh) domestic consumers took 265·8 million (1·42d/kWh), farms and agricultural establishments 27·6 million (1·35d/kWh), factories and workshops 229·9 million (1·21d/kWh) and shops, offices, etc., 112·8 million (1·78d/kWh). The average price of the bulk supply to the B.E.A. was 0·94d/kWh compared with 0·70d/kWh in 1950.

The Board's accounts record a total revenue of £5,473,354 and expenditure, including interest and depreciation, of £5,456,834, leaving a profit of £16,520, to which is added £27,674 brought in.

The report, which is published by H.M. Stationery Office, price 1s 9d, also refers to the arrangements made for salmon and trout angling. In May 6,500 yearling trout were put into the new Loch Faskally created by the Pitlochry dam. Experiments were carried out with electric fish screens and an electric counter gave promising results; improvements are now being tried out.

Speaking at Glasgow last week, Mr. Thomas Johnston, chairman of the Board, said that in the next twelve months it might be necessary to make a slight increase in tariffs. The Board had just raised £20 million by an issue of stock bearing interest at 4¼ per cent compared with the 3½ per cent of the previous issue. This meant an additional £150,000 per annum and came on top of a series of increases in other costs.

Table 2.—Schemes Under Construction and Proposed

Station and Gross Head (ft)	Plant Capacity kW	Est. Av. Annual Output Mill. kWh
UNDER CONSTRUCTION		
Errochty (Tummel-Garry), 610	75	103
Fasnakyle (Affric), 522 ..	24·4	31
Clachan (Shira), 965	40	80
Glascarnoch, 529	24	112
Luichart, 185	24	124
Torr Achilty, 52	15	36
Finlarig (Lawers), 1,362 ..	30	80
Quoich (Garry), 320	22	77
Invergarry, 175	20	82
Others*	17·6	84
Total	292	809
PROMOTED BUT NOT YET UNDER CONSTRUCTION		
Ceannacroc (Moriston), 296 ..	17·5	70
Invermoriston, 306	32	111
Others*	21·6	51
Total	71·1	232
IN COURSE OF PROMOTION		
Orrin	18	79
Shin	44	167
Breadalbane	88·5	304
Others*	4·5	18
Total	155	568
UNDER SURVEY		
Farrar	65	240
Grandtully	11	54
Awe	55	167
Tilt	40	140
Glass-Morie	25	76
Others*	16	74
Total	212	751

* Under construction: Gairloch, Grudie Bridge, Striven, Lussa, Sron Mhor (Shira), Storr Locks 1st stage, Gaur, Achanalt (Glascarnoch-Luichart-Torr Achilty). Promoted but not yet under construction: Doe (Moriston), Livishie (Moriston), Lairige (Allt-na-Lairige) and Loch Dubh (Ullapool). In course of promotion: Mucomir and Kilmelfort. Under survey: Affric extensions, Kenmore, Cowal extensions, Lussa extensions, and Rannoch and Tummel.

VIEWS on the NEWS

By REFLECTOR

FURTHER evidence of the intention of Electricity Boards to adopt a more aggressive policy was given by Alderman W. S. Lewis, chairman of the Midlands Board, last week at the Birmingham Section of the British Industries Fair. He said that the Board would continue to develop the use of electricity. It was not true that it was "unpatriotic" to use electricity in certain ways because solid fuel could do the job more economically. When the facts were known it would be agreed that it was in the country's interest to use more and more electricity. I fully support Alderman Lewis's views especially when it appears that rising costs are likely to involve his Board in a loss of "some hundreds of thousands of pounds." It is not only rising costs but restricted use which is putting the supply industry in this position.

* * *

Most of the reports I see relating to rural electrification are of complaints by villagers that they are unable to obtain electricity, or that the Electricity Board wants too much for a supply. Yet electricity is still being brought to the countryside and the inhabitants are usually very happy about it. A recent instance is that of the parishes of Hillfarrance and Oake (Somerset) where, to celebrate the advent of electricity, the rector's wife prepared an illuminated address for presentation to Mr. H. D. Weeks, the manager of the Taunton District. This, says the *Somerset County Gazette*, bore some light-hearted verse, with illustrations, on the benefits brought to the district by electricity.

* * *

The decision of the Eastern Electricity Board to terminate rental wiring agreements and to offer the consumers the installations at "bargain" prices has impelled one member of a rural district council to use strong language. After mentioning that the Board took over the Norwich undertaking without paying for it this councillor said:—

> "They are now asking people to pay for wiring they have pinched, confiscated, stolen or anything else. They are asking for a rental for a thing they have never paid for. I call that colossal cheek—asking people to pay for wiring they never paid for themselves."

* * *

Another coroner has expressed the view that "electricity is dangerous" in giving his verdict in a case of fatal electric shock. Of course it is, as are gas, water, fire, motor cars, oranges, or a thousand other things if they are not handled in a reasonable manner. This particular death was caused by the use of a defective hair dryer in a bath. It is incredible that people can be unaware of the dangers inherent in the use of electrical appliances in bathrooms after all the publicity which the matter has received.

* * *

Many strange inquiries reach the *Electrical Review* Information Department I am told. A recent one desired information about some form of signal, working from 6 and 12 V car batteries, suitable for announcing the arrival of a fish and chip van in villages. I gather that this takes the form of musical chimes (similar to those sometimes used as doorbells). It seems a pleasant substitute for the klaxon which is often employed to announce the advent of itinerant tradesmen—or even for the older street cries: one of the minor blessings of electricity in fact.

* * *

In this connection, the *Daily Mail* reports the case of an ice-cream vendor who was fined for sounding the horn of her van to attract customers. Subsequently she installed a musical box with an amplifier and again she was summoned and fined. Upon appeal to quarter sessions, however, the conviction was quashed and she was allowed costs.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

"Better Installations"

IT was with some surprise that I found myself in complete agreement with the general views expressed by the various contributors on the above subject.

However, perhaps the discussion could be carried a stage further, with a view to examining the reasons for the shoddy workmanship which is all too prevalent to-day. Because a worker, or a contractor, has been educated to produce a high standard of work, it is not necessarily the case that this high standard automatically follows; in fact, the writer has found no appreciable improvement in a good many cases. If a person has pride in his work he will carry out a job in such a manner that no room for criticism exists.

Having had a discussion recently with a consulting engineer, I asked him how he would assure himself that any particular installation (conduit or lead covered) had been executed in a workmanlike manner. His reply, typical of consulting engineers, supply authorities, insurance companies, etc., was that he would test for insulation and continuity with the appropriate instruments. When I pointed out that this would not satisfy me, he looked blank. I suggested that it was quite possible to obtain a good result at the time the job was done, but within a very short period very bad readings could easily be obtained for a variety of reasons, bad workmanship being the principal one.

It is not uncommon for two conduits to be joined by about two threads, but our friend the consultant did not think this important. This not unnaturally led me to the conclusion that he would not be a very satisfactory operative himself.

It has been my experience over the past twenty years that a goodly proportion of the electricians in this country cannot or will not cut conduit straight. The only answer to this problem of bad workmanship would seem to be a strict examination of all new installations by competent inspectors. The supply authorities should be compelled by law, not merely to test an installation, but to examine it thoroughly and to condemn any existing installation which does not comply with the Rules. In the meantime the I.E.E. Regulations would do, but even these require tightening up. This would enable all the "good" contractors to go on a world cruise every year, and it would also please the trade union.

Glasgow. ALEX. MILNE.

The Anti-Electric Campaign

AS an ordinary consumer, may I say how much I agree with your editorial "Counter-Attack"? For some time past I have been viewing the retrograde and misleading anti-electric propaganda with great concern.

Some three years ago we moved into a cottage which had been modernized after war damage. One of the first things we did was to have all fire-places removed and blocked up to eliminate the dust, dirt, draught, unnecessary work and waste caused by open fires. We then had electric points installed in every one of the five rooms, leaving only the kitchen to run on gas (for cooking and instantaneous water heating). Incidentally, I have never read of any electrical organization trying to frighten the consumers away from the use of gas.

As a result of our foresight, we have not purchased one ounce of coal since we have been in this house; we have, by means of movable electric heaters, been able to eat in the dining room and live in the living room in comfort even in the coldest weather; and our total fuel bill (including light and also including the gas used for cooking and water heating) has never exceeded £20 in any year. With the latest addition to the family, we have got an electric dryer and airer, making light work of the familiar "nappies" line.

I defy any Ministerial or private exponent of theoretical thermal efficiency to show me how we could have saved fuel, time and labour with the same standard of comfort

by cutting out electricity. And I would like to add that in my experience most people who burn coal all day long have *additional* electric heaters sometimes in the same room, and certainly in other rooms. Let those who wish have the undeniably cheerful glow of the open fire: but let people like us have a little respite from the continuous official insinuations that we are ruining the country.

*Anerley, S.E.*20. IAN S. MENZIES.

District Managers' Organization

I AM directed by my executive committee to notify you of the formation of the Association of District Managers (Electricity Supply). The main objects of the Association are to promote the closest co-operation of District Managers of "single-headed" organizations within the electricity supply industry and to maintain the interests and welfare of its members in all matters affecting their positions and general status, and to facilitate the interchange of information and experience for the benefit of its members in the discharge of their duties.

We are fully aware of the existence of other organizations which are responsible under Section 53 of the Electricity Act, 1947, for settling by negotiation the terms and conditions of employment of persons employed by the British Electricity Authority, and it is neither our desire nor intention to encroach upon functions of the existing negotiating machinery. We feel, however, that as the administrative duties and responsibilities of District Managers are common and that they form an important and vital link between the Electricity Boards and the consumers of electricity, the Association is in a very strong position to submit a considered and logical opinion on any matter affecting the duties and responsibilities of its members to the appropriate negotiating organizations.

Membership at the present time consists of District Managers employed by the Midlands Electricity Board, but our members feel that the extension of membership to all District Managers of the British Electricity Authority would be to their fullest advantage. Particulars can be obtained from the undersigned at 83, Brandhall Road, Langley, Birmingham.

Birmingham. S. RAYBOULD, *Hon. Secretary.*

Works "Open Day"

MORE than 700 relatives and friends of employees of Foster Transformers & Switchgear, Ltd., accepted the invitation of the management to tour the company's Wimbledon Works on Saturday last. This was the first time that Fosters (a Lancashire Dynamo company) had entertained guests in this manner but the success of the occasion will no doubt prompt a repetition.

A great deal of careful preparation ensured that, with the minimum of difficulty, the visitors were able to secure a very complete picture of the work of the company. By following a carefully marked route they were conducted through all the stages of transformer manufacture from the initial winding of the coils and the cutting of the laminations for building the cores to the finished job ready for despatch. Amongst the latter items was the first of a series of 2,000 kVA, 44 kV transformers for the Hydro-Electric Power Commission of Ontario. In addition, guests were able to see some of the more specialized activities at Fosters, including items from the range of test equipment and voltage regulators. During the afternoon Mr. Raymond Ely, the managing director, with Mrs. Ely and various executives, made a complete informal tour.

A group of visitors at the Foster works watching a core and coil assembly being lifted ready for tanking

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE British Electricity Authority, Southern Division, announces the appointment of **Mr. R. G. Henbest, A.M.I.E.E., A.M.Inst.F.**, deputy station superintendent at Earley generating station, as station superintendent in succession to **Mr. C. J. Stockell, B.Sc.(Eng.), A.M.I.E.E., A.M.I.Mech.E., A.M.Inst.F.**, who is now station superintendent at Poole. Mr. Henbest was educated at Bridge Boys' School, Harrow, and Acton Technical College, and was apprenticed to the General Electric Co., Ltd., after which he held appointments with Kodak, Ltd., and the North-Eastern Electric Supply Co., Ltd. Later he served as charge engineer, maintenance engineer and station superintendent at Cambridge, and station superintendent at Cowes. He has been at Earley since November, 1950.

Mr. E. G. Rowledge, director and manager, Prestcold Refrigeration Division of the Pressed Steel Co., Ltd., has been appointed a local director of the company. Mr. Rowledge has been in the refrigeration industry for twenty-eight years and is a member of the Institute of Refrigeration and the American Society of Refrigeration Engineers. He has travelled extensively around the world. Mr. Rowledge joined the Refrigeration Division of Pressed Steel Co. in 1934 as chief engineer.

Mr. E. G. Rowledge

Councillor T. R. Lythgoe, a member of the Wigan staff of the North Western Electricity Board, has been nominated as Mayor of Wigan for the ensuing year. He has been a member of the County Borough Council since 1936 and is chairman of the Street Lighting and Planning and Development Committees.

Mr. S. A. Russell, senior assistant engineer (electrical) No. 3 Sub-Division of the North Western Division of the British Electricity Authority, retired on 10th May, having completed forty-nine years' service in the electricity supply industry. He commenced with the Manchester Corporation Electricity Department in 1903, and after periods at Ashton-under-Lyne, Leicester and Bristol returned to Manchester. In 1930 he was appointed generation engineer to the Manchester Electricity Department, and at vesting date became executive officer for the Manchester stations with the B.E.A. From 1945 to 1947 Mr. Russell served with the Allied Control Commission in Germany.

Mr. F. A. S. Walker, A.M.I.E.E., the former deputy superintendent at the York power station of the Yorkshire Division, British Electricity Authority, has been appointed station superintendent at Greenhill (Oldham) in the North Western Division, B.E.A. In 1933 Mr. Walker was appointed a demonstrator in the Department of Electrical Engineering at Loughborough College, and later became test engineer with the British Thomson-Houston Co., Ltd., and Newton Bros. (Derby), Ltd. He has also served in various capacities with several electricity undertakings and from 1946 to 1949 was charge engineer at Sculcoats power station, Yorkshire Division.

Mr. D. E. Brooks has been appointed an outside representative at the Liverpool branch of W. T. Henley's Telegraph Works Co., Ltd., to assist Mr. S. Roy Gee, branch manager. Mr. Brooks joined Henley's head office in 1939.

Dr. P. Dunsheath has been re-elected chairman of Convocation of the University of London for a further four years.

Mr. H. Silman, B.Sc.(Lond.), F.R.I.C., has been elected president of the Institute of Metal Finishing for the 1952-53 session.

Mr. S. O. Bowker has resigned as chairman and managing director of S. O. Bowker, Ltd., owing to ill-health, but he will remain on the board of the company.

Mr. S. O. Bowker

The annual ball of the Tees-Side Committee of the **Electrical Industries Benevolent Association** held in the Town Hall at Middlesbrough last February was attended by over 500 guests. The function enabled the Committee to forward through their chairman, Mr. S. Tillotson, manager of the Tees Sub-Area of the North Eastern Electricity Board, the sum of £290 to the headquarters of the Association.

Mr. John Oldham, O.B.E., J.P., chairman of Oldham & Son, Ltd., sailed in the *Queen Elizabeth* on 14th May for the United States, to visit his company's associates there. He will be away about a month.

Mr. J. H. Jupe, A.M.I.E.E., has resigned from his post as press officer to the General Electric Co., Ltd., to take up an appointment in the technical information division of Marconi's Wireless Telegraph Co., Ltd., at Chelmsford.

Three new appointments have been made at district offices of the Metropolitan-Vickers Electrical Co., Ltd., as from 1st April. **Mr. E. Mead**, B.Sc.(Eng.)Lond., M.I.E.E., has been appointed assistant manager of the London office, **Mr. R. Allen**, Assoc.M.C.T., A.M.I.E.E., assistant manager of the Birmingham office and **Mr. T. Gill**, B.Sc., A.M.I.E.E., manager of the Swansea sub-office.

Mr. Mead obtained his early training at Brighton Technical College and joined M-V as a college apprentice in 1925. From 1926 to 1933 he specialized in heavy switchgear, spending a short time with Manchester Corporation Electricity Department and also handling contracts for Russia and for the C.E.B. 132 kV South-West grid scheme. In 1933 he became manager of the Stoke-on-Trent sub-office, and in 1944 was appointed to the London office, where he has been actively concerned with the B.E.A. and the Electricity Boards.

Mr. Allen, who was educated at Manchester Grammar School, joined M-V (then British Westinghouse) in 1916 as a trade apprentice, winning a company's scholarship to the Manchester College of Technology. In 1921 he joined the Motor Engineering Department, and in 1926 transferred to the General Engineering Department, where he dealt with industrial electrification schemes. In 1947 he moved to the M-V Birmingham office as senior plant sales engineer.

Mr. Gill was educated at Burnley Grammar School and Manchester University. He joined M-V in 1925 as a college apprentice, and on completing his course he entered the Motor Sales Department. In 1930 he transferred to the Glasgow office, and two years later to the Cardiff office. Mr. Gill is assistant hon. secretary (Cardiff area) of the Western Centre of the Institution of Electrical Engineers. He is also a past-president of the South Wales branch of the Association of Mining Electrical and Mechanical Engineers.

Mr. F. N. Beaumont, B.Sc.(Eng.), M.I.Mech.E., M.I.E.E., Mem.A.I.E.E., has been appointed engineer-in-charge of the Utilities group of the Anglo-Iranian Oil Co., Ltd., London. Mr. Beaumont joined the Anglo-Iranian Oil Co., Ltd., in 1947 and became chief electrical engineer in 1949. During this period he has been responsible for the electrification of many refineries and associated plant, not only in the United Kingdom but also on the Continent and in the Middle East and has initiated many new designs of electrical equipment for the oil industry, including a wide range of remote controlled flameproof starter equipment for electric motors. He will be succeeded, on the electrical engineering side, by **Mr. C. F. Mares**, A.M.I.E.E., who has acted as deputy and technical development engineer for the last three years.

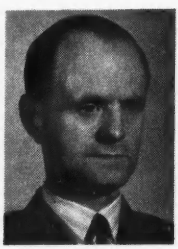
Whitehouse Industries, Ltd. (Philidas Division) announces the appointment of **Mr. Gordon E. West** as sales manager for London and the Home Counties. Mr. West will be operating for the time being from his home address at Mansard Cottage, West Farm Avenue, Ashtead, Surrey.

The group sales staff of **Parkinson & Cowan, Ltd.**, were entertained to dinner by the directors at the Trocadero Restaurant, London, on 2nd May.

The Dramatic Section of the **Johnson & Phillips Social Club** gave three performances of Falkland L. Cary's comedy drama "Candied Peel" in the Club's Hall at Charlton on 8th, 9th and 10th May. The Friday evening audience included the chairman of J. & P., Mr. G. Leslie Wates, J.P., Mrs. Wates and Mr. R. W. C. Reeves, M.I.E.E., a director.

At the Rugby Works of the British Thomson-Houston Co., Ltd., on 15th May, **Mr. P. G. Hibbs**, B.E.M., was presented with a three-piece suite in recognition of his fifty years with the company. In making the presentation Mr. H. L. Satchell, director and manager, Rugby Works, mentioned that only a short time ago Mr. Hibbs had received from Lord Willoughby de Broke the B.E.M. which he had been awarded and richly deserved. Mr. Hibbs, in acknowledging the gift, spoke appreciatively of the

Mr. E. Mead



Mr. R. Allen

Mr. T. Gill

compa[illegible] and his colleagues. Earlier, Mr. Hibbs has been presented with a travelling rug by his fellow workers in the Pattern Department.

Mr. E. L. M. van Gelder, director and general manager of the Phœnix Telephone & Electric Works, Ltd., was entertained at a dinner to mark his forty years' service to the company, at the Trocadero, London, W, on Monday last. Mr. E. N. Epstein, chairman of the company, presided and about 200 members of the staff and friends were present. Mr. Epstein, Mr. J. W. Green, O.B.E., Miss A. Jackson and Mr. B. S. Sago paid tribute to Mr. van Gelder and Mrs. O. Epstein handed him an album containing the signatures of those who had subscribed towards the cost of a television set for presentation to him. In thanking the company for the gift, Mr. van Gelder briefly mentioned some of the "high spots" in the company's history and said that prosperity could come only by working and saving.

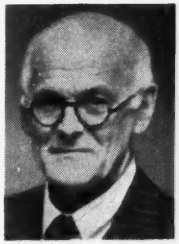
OBITUARY

Mr. F. M. Burrell, M.I.E.E., M.I.Mech.E., a director of the Jersey Electricity Co., Ltd., and former chief engineer and manager of the company died on 28th April at his residence, The Retreat, La Pouquelaye, Jersey. Mr. Burrell, who was a native of Norfolk, went to Jersey in 1924 as resident engineer for the Contracts Department of Crompton & Co., and it was under his supervision that the original power station at Albert Pier was constructed and the mains in the parish of St. Helier were laid. He then became chief engineer and manager of the Jersey Electricity Co. until his retirement in 1946, and he had since continued his association with the company as a member of the board. Before going to Jersey he carried out several electrification schemes in India, notably in Allahabad and Lucknow, and in the United Kingdom was associated with the development of electricity in Sevenoaks and Petersfield. He was with the Brush Electrical Engineering Co. at Loughborough as a pupil, and he was a student of Leeds Engineering College.

The late Mr. F. M. Burrell

Mr. William Dickinson, engineer of the Bury District of the North Western Electricity Board, died on 23rd April. Mr. Dickinson, who was sixty-one, was formerly with the Yorkshire Electric Power Co., Salford Corporation and Bury Corporation (distribution superintendent).

Dr. W. Wilson.—The death occurred on 16th May of Mr. William Wilson, D.Sc., B.Eng., M.I.E.E., F.Inst.P., M.Amer.I.E.E., head of the development laboratory at the Witton Works of the General Electric Co., Ltd. Dr. Wilson obtained his Bachelor of Engineering degree at Canterbury University College, New Zealand, and came to this country in 1916, joining the G.E.C. in the following year. He was the author of many textbooks and had over sixty patents to his name, chiefly in connection with switch and protective gear. He was chairman of the South Midland Centre of the Institution of Electrical Engineers in 1927 and of the South Midland Radio Group in 1944. His valuable work as chairman of various technical committees of the B.S.I., E.R.A. and B.E.A.M.A. is recognized throughout the electrical industry.



The late Dr. W. Wilson

WILLS

Mr. W. G. Swain, a director of Lancashire Dynamo Holdings, Ltd., and managing director of Crypto, Ltd., who died on 2nd January last, left £10,355 gross (£7,500 net).

Mr. R. J. S. Bower, managing director of the Bower Engineering Works (Electrical & General), Ltd., who died on 20th November last, left £27,590 gross (£26,040 net).

Mr. F. R. Davenport, J.P., M.I.E.E., a former managing director and the last surviving director of Willans & Robinson, engineers, who died on 29th January, left £41,588 gross (£41,399 net).

Hired Wiring Agreements

AT its meeting on 16th May the Eastern Electricity Consultative Council passed a resolution to the effect that in view of the great resentment which had been caused by the Board's decision to terminate the arrangements for hired wiring installations in Norwich and elsewhere (which was a matter on which the Council should have been consulted) the Board should be asked to review its proposals and explore the possibility of either (*a*) vesting all installations, independent of age, in the appropriate party, i.e., landlord or tenant, or (*b*) continuing the arrangement on the existing basis, including maintenance for all consumers whose installation was less than 20 years old.

Electric Lamp Industry

Implementation of Recommendations

IN a written reply to a question by Mr. A. Lewis, the Minister of Supply, Mr. Sandys, said he had considered the report of the Monopolies Commission on the supply of electric lamps, together with the observations submitted by the Electric Lamp Manufacturers' Association. The Commission summarized its recommendations as follows:—

(i) That E.L.M.A. should undertake that members who sold lamp components (other than patented components and ready-coiled filaments) would make them equally available to members and non-members at prices not higher to non-members than to members; (ii) that, if the working of the new patent policy resulted in an appreciable reduction of the degree of competition to which E.L.M.A. was subjected, the whole question should be re-examined; (iii) that E.L.M.A. members should give an assurance that the controlled companies would continue to provide a measure of competition as suppliers of cheap lamps and would not be used as "fighting companies;" (iv) that the sales quota system should be brought to an end; (v) that E.L.M.A.'s rules about "Type B" lamps should be altered to remove quantity and quality restrictions; (vi) that the arrangement for exclusive dealing and aggregation of quantity rebates should be brought to an end; (vii) that payment to associations of distributors should be brought to an end; (viii) that the enforcement of resale price maintenance by means of the collective sanctions of fines and the stop list should be brought to an end; (ix) that E.L.M.A.'s rules should be altered to permit other distributors as well as co-operative societies to give "dividends."

Furthermore the Commission expressed the opinion that the continuance of the practice of fixing common manufacturers' prices should be subject to two conditions, namely:—(*a*) that E.L.M.A. members should take steps to ensure that the system of exchange of technical knowledge extends to all manufacturers within the system of common prices; and (*b*) that the level of prices fixed by E.L.M.A. should be reasonable.

The Government was in agreement with recommendations Nos. (i), (ii), (iii), (iv), (v), (vii), (viii) and (ix), and with the two conditions which the Commission laid down for the continuance of the system of common prices. With regard to recommendation No. (vi) the Government agreed that the arrangements for exclusive dealing should be brought to an end, but it proposed for the present to reserve judgment on the recommendation that aggregated rebates should be abolished in order to give time to ascertain whether or not the continuance of this arrangement would tend to impair the effects of the abolition of exclusive dealing. In adopting this course, regard had been had to the Commission's view that the practice of fixing common manufacturers' selling prices, with which the system of aggregated rebates was associated, facilitated the exchange of technical knowledge within the industry. Account had also been taken of the possibility that the abolition of aggregation might adversely affect the position of the smaller manufacturers in the Association.

The position had been fully discussed with the Electric Lamp Manufacturers' Association which had given him assurances that it was taking action to bring its arrangements into conformity with the Government's conclusions.

Welding Conference

THE International Institute of Welding is holding its annual meeting this year in Gothenburg, Sweden, from 7th to 13th September, by invitation of its Swedish member societies.

The first item on the programme will be a meeting of the Governing Council of the Institute on 7th September. The following four days will be devoted to meetings of the 15 technical commissions composed of representatives appointed by the societies belonging to the Institute. On the morning of 12th September there will be visits to shipyards and other works in Gothenburg, while in the afternoon four papers on welding in shipbuilding will be presented by representatives of France, Great Britain and the United States. The assembly closes with a meeting of the Governing Council on 13th September, after which delegates will be free to join in a programme of works visits in Stockholm, Malmö and other industrial centres organized by the Swedish member societies of the International Institute of Welding.

A full programme of entertainment has been planned for the benefit of delegates including a reception by the Gothenburg City Council on 8th September and a banquet given by the host societies on 11th September. Further particulars of the meeting and enrolment forms are available from Mr. G. Parsloe, Secretary-General, International Institute of Welding, 2, Buckingham Palace Gardens, London, S.W.1.

Industry and the House

Purchase Tax, E.P.L. and Road Haulage

By T. F. COOK, M.P.

THE House has been discussing the Finance Bill in an atmosphere that no one ever imagined would be possible. There has been only one all-night sitting and not a single closure motion. How long this will last no one seems to know. The Chancellor, as was expected, made concessions on purchase tax to the extent of £17 million. The debate gave an opportunity to every member representing a textile constituency to say his piece. Mr. Butler summed it up very well when he said that he had had a full education in economic geography as a result of the debate and he now knew what every constituency produced.

Members in general are asking whether the removal of purchase tax will have the desired effect in present-day conditions. And if purchase tax is taken off textiles then what about the radio industry, the furniture industry and domestic products of the electrical industry—vacuum cleaners, refrigerators, water heaters and so on? Haven't they also a justifiable claim for consideration?

Traders and Purchase Tax Concessions

One of the main problems arising from any purchase tax removal has not yet been solved although everyone plays with the problem but never seems to offer any clear cut solution. Who has to bear the losses from any sudden abolition or reduction of purchase tax? There are already complaints that with the concessions now made some traders are involved in losses. It is no answer to say that they can get rid of stock bearing the higher rate. Obviously firms will hold varying stocks and those with smaller amounts will be at a decided advantage. In any case the public will not buy goods bearing the higher rate when they know a reduction has been authorized. It is felt, of course, that the various industries affected should be working out an acceptable solution to what may well be a great dilemma. On the other hand it would be fair to ask whether purchase tax is now a permanent feature of our taxation system; successive Chancellors have shown no great inclination to forgo to any extent this easily collected revenue.

It now looks as though Mr. Butler will be compelled by the pressure exerted by both sides to alter his ideas on the excess profits levy which is in present circumstances a clumsy and ill-conceived tax. The House has not yet heard a single favourable comment on this tax and the general feeling is that Mr. Butler would be far wiser to drop the whole thing. The question then arises that if he does and has budgeted for a fair measure of income from it, is he prepared to knock his Budget out of gear? Probably by the time this article is read we will have had an answer.

Need for Wage Restraint

Mr. Butler has made appeals to the Trades Union Congress to apply the policy of wage restraint but there is a clear indication that the trade unions are not willing at this stage to accept any system of wage restraint without firm guarantees from Mr. Butler that he is prepared to meet rising costs by increases in the food subsidies or indeed a return to the previous level of food subsidies. They argue that there is no tendency visible at the moment to show that prices are falling or will fall.

Mr. Butler in a recent statement to representatives of the T.U.C. and employers' representatives said there was a real chance of stabilizing prices and a greater need to keep down our export prices. Wage claims are already proposed for between seven and eight million workers and in addition over two million may get increases under existing sliding scale cost-of-living agreements. He claimed that the rise in prices which started roughly two years ago was largely compensated for by the wage increases granted up to the early part of this year. He stated that nothing

that had happened since would seem to him to justify a general increase in wages to-day, though there might be a case for some moderate adjustments. He agreed that profits should be taken into account in any consideration of wages and prices but gave no indication of any possible new restrictions. The Chancellor's statement will be examined by the T.U.C. General Council and the employers' organizations and further meetings are likely. No one seems to entertain very high hopes that Mr. Butler will accomplish much from his request for a " wage freeze."

The Lords have discussed the Government's road haulage policy and Lord Lucas led the attack for the Opposition. The major debate was to take place in the House of Commons on Wednesday this week. At the time of writing it is expected that the Opposition will again make it clear that any future Labour Government will re-nationalize road transport. One of the big issues is a demand for the protection of workers now employed in the nationalized industry. When road transport was nationalized the workers were assured that their position would not be worsened. Although Lord Leathers stated that the vast mass of managing, operational and maintenance jobs would remain, but with private enterprise instead of with the Road Haulage Executive, he admitted that there would be a reduction in the number of clerical staff which might affect many employees.

Lord Lucas asked who would pay compensation to displaced staff—the State or the private " hauliers." Lord Leathers replied not the latter, but plans for compensation for those who might suffer from displacement were being worked out on recognized lines and would be included in the Bill. The general feeling was that some clarity might emerge from the Commons debate this week.

PARLIAMENTARY NEWS

From Our Special Reporter

IN the House of Commons last week Mr. Eric Johnson asked the President of the Board of Trade if he was aware that a British firm of electrical engineers who quoted a price to the United States Army Corps of Engineers 20 per cent below the lowest American tender for nine transformers for the Garrison Dam, North Dakota, had been informed that, although this tender met fully all technical requirements, the order was likely to be placed with an American firm; and what steps he was taking to assist this firm to obtain this contract, in view of the importance of dollar exports.

Mr. Peter Thorneycroft said that information which he had received from the British Embassy in Washington confirmed that the bid of the British firm referred to was in the neighbourhood of 20 per cent below that of the lowest American tender. The Embassy had also been informed that the British firm, in common with other bidders, had met the specifications of the invitation to tender, including the delivery schedule.

The various tenders were at present under consideration by the United States authorities and it would therefore be inappropriate for him to comment on the likely outcome. He was, however, aware that in considering tenders by foreign firms the United States authorities were required to take into account the provisions of the " Buy American " Act. The British Embassy was maintaining close touch with the British firm and was giving it all possible assistance.

Electricity in Arran

Replying to Mr. Rankin the Secretary of State for Scotland (Mr. Henderson Stewart) said he was informed by the North of Scotland Hydro-Electric Board that the average price of electricity sold to all consumers in the Island of Arran immediately before the Board took over in 1946 was 7·86d/kWh. The present average price was 1·80d/kWh, a decrease of 77 per cent. There were 577 consumers when the Board took over and 1,643 at 30th April, 1952.

Beryllium Copper

Mr. Erroll asked the Secretary for Overseas Trade as representing the Chancellor of the Duchy of Lancaster, what steps he was taking to increase the supplies of beryllium copper to manufacturers in this country.

Mr. Henry Strauss said that beryllium copper was imported on private account, but the Minister understood that shipments of the master alloy from the United States, which was the only source of supply at present, had amounted to about 40,000 lb so far this year. It would be contrary to practice to publish the volume of outstanding orders. Importers had

for some time been finding considerable difficulty in obtaining supplies but, thanks to representations through official and trade channels, the position had become rather more encouraging. Beryllium copper was, however, likely to remain scarce for the present, and he could not predict when the outstanding demand was likely to be met in full.

Technicians for Electronics Industry

Mr. Malcolm MacPherson asked the Minister of Labour what steps he proposed in order to enable the electronics industry to recruit in sufficient numbers the necessary scientists and highly-qualified technicians.

Sir Walter Monckton said that the manpower needs of the electronics industry were being closely studied by the Technical Personnel Committee which was reconstituted last year under the chairmanship of Lord Hankey, and he hoped that certain measures now under consideration would be of practical assistance.

Domestic Heating

A FRIDAY evening discourse at the Royal Institution was given on 16th May by Mr. J. S. Hales on the "Science of Domestic Heating." Illustrating his remarks by slides and demonstrations of modern laboratory apparatus, the lecturer revealed the nature and magnitude of the researches still necessary to secure major improvements in thermal efficiency and smokeless combustion of coal and to reconcile comfort conditions with economy.

Comfort conditions he defined as like those obtaining out of doors on a fine spring morning when there were radiation from the sun, a moderate movement of cool air and not too much humidity. Discomfort indoors was experienced when the air was much warmer than the walls or when the head was warmer than the feet. Floor heating gave the most level temperature gradient from the ground to the ceiling.

A typical percentage heat distribution from a modern stool-bottom open fire was: lost to flue, 40 to 45; radiation, 20 to 25; convection, 15 to 20; unburned gases, 10 to 15; unburned coal in ash, 2 to 5. Ventilation from room to flue might amount to 6,000 cu ft/hr, which was about 4,500 more than was desirable. The extreme discomfort of domestic heating arrangements in this country had long been criticized by visitors from other lands, where houses were heat insulated and where fires embodying some of the more modern principles had been installed as far back as 1620. It was only at the beginning of the present century here that such devices as the adjustable canopy fire came into use to restrict loss of heat by flue draught regulation. The chief obstacle to advance in the past had been a lack of laboratory equipment and of a scientific approach to the problem, but as a result of co-operative research gradual improvements could be expected in the future.

Fuel Efficiency

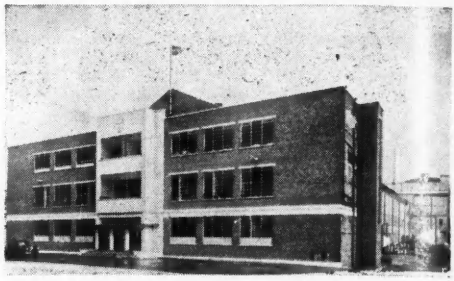
THE correspondence on this subject has continued in *The Times*. In a further letter Mr. E. R. Wilkinson, commercial manager of the British Electricity Authority, averred that taking everything into account (including heat units used in gasworks, heat lost in tar and breeze sold for roads, etc.) electricity could be shown to have an overall thermal efficiency of 19 per cent at the point of use against 16 per cent for gas. This brought a reply from Mr. F. G. Brewer, secretary of the Gas Council, who said that breeze was not used for roads and that it should not be argued that tar was a debit not a credit. He produced figures purporting to show that the coal consumption in generating electricity was twice that used to produce gas of an equivalent heat value.

Dr. R. Lessing intervened to show how great a proportion of incombustible matter appeared in present-day coal adding considerably to wasteful handling costs and contributing to atmospheric pollution. He thought that the B.E.A.'s pride in its claim to burn large quantities of inferior coal was hardly justified when the nation's budget was considered. It seemed sounder economics to clean coal at the colliery, utilize the carbonaceous shale extracted from it for power generation on the spot and return the burnt-out shale to the pits to prevent subsidence.

North Wales Power

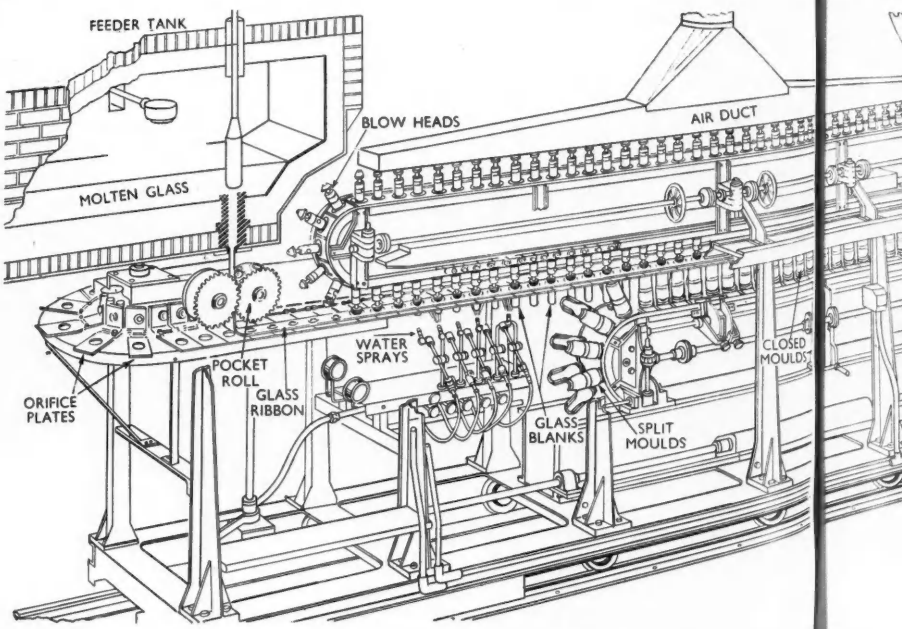
THE British Electricity Authority has decided not to proceed, in the North Wales Hydro Electric Power Bill, 1951–52, now before Parliament, with the promotion of those provisions which relate to the Ffestiniog scheme. As the result of discussion with other interested parties, the Authority's advisers have considered further facts recently brought to their notice regarding geological and other conditions affecting the proposed reservoir at Llyn Cwmorthin and the measures to be taken to safeguard the adjoining quarry workings. In consequence, the Authority is of opinion that further action on this scheme should be deferred to allow for a review and possible modification of these works. The Bill covers three of the original eight schemes estimated to cost £20 million and to increase the total production of electricity in North Wales from 110 million to 625 million kWh a year. The Ffestiniog scheme was one of six involving eighteen new schemes and eighteen new reservoirs. Ffestiniog itself was to have had three new stations. The remainder of the Bill is concerned with extensions of the existing catchment areas to the Dolgarrog and Maentwrog hydro-electric stations.

Making Glass Bulbs



A New Method of Quantity Production

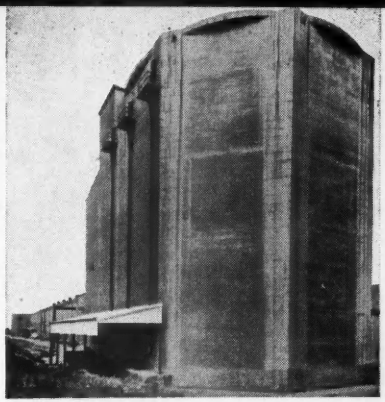
GLASS bulbs of many different types and sizes are required in large quantities by the electric lamp and radio valve industries. They were formerly all made by skilled hand blowers, but during the past twenty-five years various automatic machines have been used to produce bulbs in considerable quantities and it has now become necessary to undertake production on a scale never previously contemplated. Accordingly, the British Thomson-Houston Co., Ltd., and the General Electric Co., Ltd., have jointly formed a new company, Glass Bulbs, Ltd., with a factory at Harworth, Notts, near Doncaster, which is capable of producing one-and-a-half million glass bulbs a day. Production of all the bulbs required for "Mazda" and "Osram" general lighting service lamps is being concentrated at this factory, the output of which is believed to be also sufficient to meet the requirements of all other lamp manufacturers in the British Isles and to allow an ample margin



for export to Europe and the Commonwealth. This great production has been made possible by the installation of two ribbon type machines which are thought to be the only ones of their kind outside the United States.

The site was chosen because of the special facilities available. Female labour is readily available in the nearby villages and coke-oven gas for firing the glass furnaces is obtainable from the adjacent Harworth Colliery. The building is 700ft long by 80ft; there are over 600 employees.

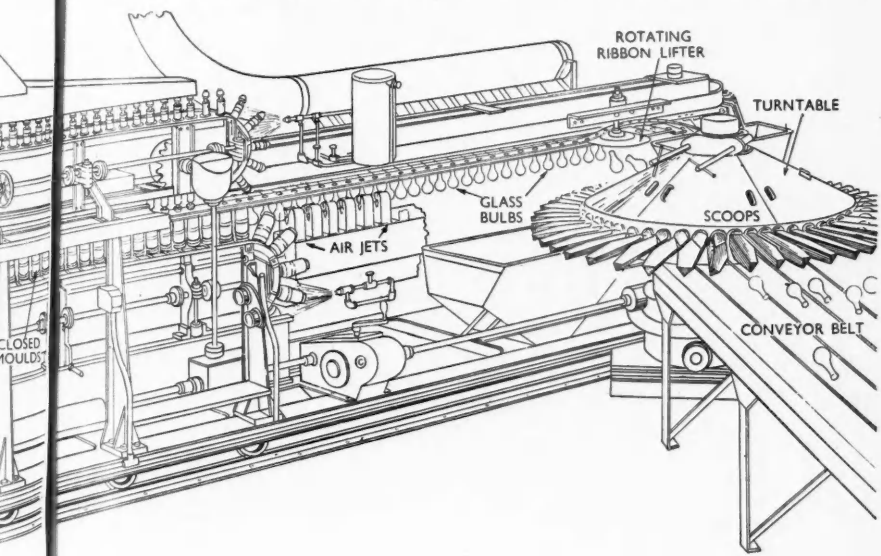
The scheme of manufacture is based on a system of "flow production" and is mechanized throughout. Private sidings, which connect with a nearby railway line, enable the raw materials to be delivered directly to the works. They are then raised by suction to the top of a 100ft mixing tower, with the exception of the sand which is blown up under pressure. This reinforced concrete tower is the only one of its kind at any glass works; it consists of seven silos, extending from the top to the bottom, each capable of holding 1,500 tons of materials: soda ash, dolomites, limestone, sand and felspar in addition to



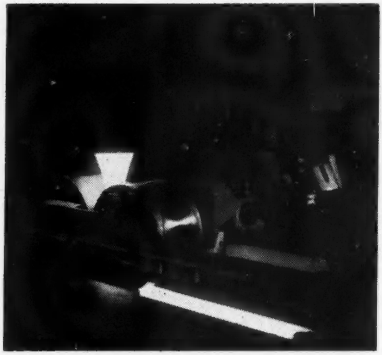
Suction pipes conveying raw materials from railway trucks to the top of the mixing tower

cullet (or surplus glass) which is delivered to its silo by a mechanical bucket conveyor inside the building. All are obtained in this country: the sand from King's Lynn, Norfolk, the soda ash from Northwich, Cheshire, the limestone from Buxton, Derbyshire, and the dolomite locally from a source near Doncaster. The resultant glass contains very roughly 72 per cent silica, 18 per cent soda, 6 per cent lime and 3 per cent magnesia.

The raw materials are reclaimed



Diagrammatic representation of the ribbon machine in operation



Stream of molten glass from the furnace passing between the rollers that form the ribbon

mechanically from shelves at the top of their respective silos and pass down chutes to automatic weighing machines two floors below whence they are discharged in correct proportions into a rotary mixing drum.

On the floor directly below the outflow at the top of the tower there are remote control panels which present a picture of the progress of events with the aid of coloured indicator lights. Most operations are controlled by push buttons on the panels, so that two men are able to supervise this important section.

From the mixing drum the blended materials are automatically discharged into canisters which are conveyed on a roller runway to a hopper which discharges into electrically-operated mobile screw feeders that force the charge, or batch, into the mouth of the continuous tank type cross-fired furnace which is capable of producing 150 tons of glass a day. Its regenerative feature enables the incoming air to be pre-heated, thus saving fuel. Temperatures are graded through the melting and refining ends, the glass finally passing through automatic forehearths, which bring the glass to the exact temperature required for feeding to the ribbon machines. Pressure in the furnace is maintained automatically at slightly above atmosphere. Remote recording and metering instruments are grouped on panels in the machine room.

The stream of molten glass flows down between two rotating water cooled rollers at one end of the ribbon machine. One roller has a plain surface while the other contains pockets, or circular depressions, so that the glass issues from between them as a continuous ribbon bearing a series of shallow circular protruding "humps" resembling the ribbon of "caps" used in a boy's toy pistol.

The hot glass ribbon leaves the rollers on a continuous belt of orifice plates, each pierced with a circular hole that comes accurately into position beneath a "hump." It moves forward to meet a chain of blowheads which descend on to it from above, each pressing into the centre of a "hump" directly over a hole in each orifice plate. A puff of compressed air issuing from the blowhead causes the "hump" to be extruded downwards through the hole in the orifice plate, the function of which is to determine the diameter of the flare at the top of the neck of the finished bulb. These glass blanks, hanging below the rapidly moving ribbon, increase in depth until they meet split moulds which rise from below on a continuous belt and close round them from both sides.

The moulds then begin to rotate and meanwhile the air pressure from the blowheads increases so that the glass blanks are moulded to their final shape. During this operation the ribbon, blowheads and moulds are all moving forward together at the same speed. On completion of this process the moulds open to reveal the bulbs and return on their belt under the machine. Similarly the blowheads break contact with the glass ribbon and return along the machine on the upper side of their chain. The orifice plates, carrying the ribbon with the blown bulbs depending from beneath it, continue to travel forward while jets of cooling air play upon the completed bulbs.

On reaching the rotating ribbon lifter the bulbs are successively tapped off by the strokes of a synchronized hammer and fall into the scoops of a rotary turntable which tip them on to a moving belt for conveyance through a gas-fired lehr, or annealing oven. The glass ribbon passes down to the floor below where it is water cooled and subsequently broken up for re-use as cullet, while the orifice plates return horizontally behind the machine.

The moulding of the bulbs is a delicately precise operation and for this reason the moulds are cork lined. The heat of the glass transforms the cork into fine carbon

which readily absorbs water from the cooling sprays that play on the moulds as they pass back under the machine. The absorbed water is vaporized by contact with the hot glass so that the bulbs are formed on a cushion of steam which leaves them with a polished surface finish.

The two ribbon machines are of different sizes: the larger has a pitch of 3·9in from centre to centre of the orifice plates and the smaller a pitch of 3in; the pitch dimension determines the size of bulb which can be blown. There are in all seven different sizes of orifice plate and rollers of two different depths of pocket: $\frac{5}{32}$in and $\frac{9}{32}$in, which cover all the sizes of bulbs and valve envelopes produced.

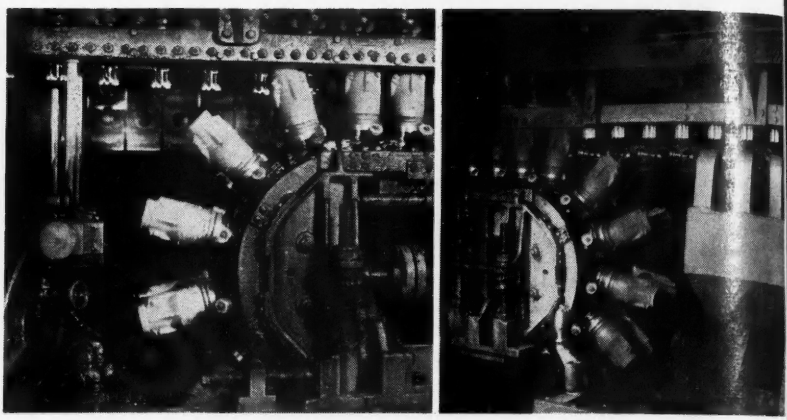
The ribbon machine is much more versatile than any other bulb-blowing machine. It will blow the miniature type of valve bulb at a very high speed and can be quickly turned over to the production of large size filament-lamp bulbs. A further important feature is the consistency of the product and its constant dimensional accuracy is said greatly to exceed that previously obtainable from any other machine. Each machine is driven by a 10 h.p. compound wound d.c. motor energized from a three-phase full-wave rectifier and electronically controlled to maintain constant speed at any setting within $\pm\frac{1}{2}$ of one per cent for a 10 per cent variation of voltage. This form of control enables the motor speed to be varied from a crawl to 1,750 r.p.m.

The larger machine, with moulds at 3·9in centres, produces from 350 to 500 bulbs a minute of the 70 mm, 75 mm and 80 mm sizes for 75 W, 100 W and 150 W general lighting service lamps. When operating on a continuous 24-hour schedule this machine gives a daily output of approximately 500,000 bulbs. The smaller machine with mould centres at a 3in pitch will produce the whole range of valve bulbs up to 44·5 mm diameter, including all the miniature types, and lamp bulbs from the 25 mm stop and tail-light size up to and including the 65 mm bulb for the 60 W general service lamp. The 24-hour output of this machine, which runs continuously, is approximately one million bulbs.

After annealing, the bulbs are air cooled while proceeding on a conveyor belt to the packers. At the control point five bulbs are picked off the belt every twelve minutes for examination and dimensional checks, continuous inspection being carried out on a quality control basis.

The packing of bulbs into cartons,

Above: **General view of the furnace, ribbon machine and entry to the annealing ovens.** *Left:* **Forehearth with ribbon machine in background**



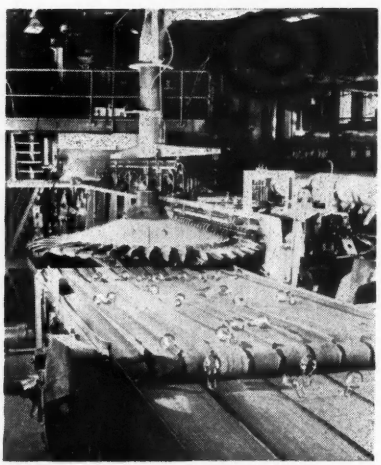
Left: **Glass blanks hanging from the ribbon meeting and entering the moulds.** *Right:* **Finished bulbs leaving the moulds ; jets for cooling air to the right**

labelling and sealing down take place on two floors of the main factory building, whence the cartons pass on conveyors to the finished bulb store. This building is 700ft long by 110ft wide; a railway line enters at one end and extends down one side for the full length of the store. On the opposite side are the road loading docks which are conveniently arranged at an angle to allow ample room for backing and turning the lorries. All loading into road and rail vehicles takes place under cover. Inside the store, cartons ready for despatch are stacked on palletts and can be easily picked up and transported by battery-driven fork trucks. Between twenty and thirty wagon-loads of bulbs are despatched from the works by rail every day.

Electric power for the works comes from a transformer substation on the factory site. All the equipment is operated by a.c. motors except the ribbon machines.

As the manufacture of bulbs is a continuous process, any interruption would involve wasteful and costly delay. Therefore, continuity of electricity supply in the event of a power cut is assured by the installation of emergency diesel-alternator sets. Similarly, oil storage tanks have been provided to enable the furnace to be oil fired should the normal supply of gas fail.

Finished bulbs being discharged from the rotary turntable on to the belt conveyor



I.E.E. Southern Centre

THE summer meeting of the I.E.E. Southern Centre on 6th June will take the form of a visit by coach to the Morris Motor Works, Cowley, Oxford. The cost of the trip, including lunch and tea, will be 22s 6d per head. Those travelling by the Brighton coach should send their application and remittance to Mr. R. M. Summarsell, S.E.E.B., Mid-Sussex House, North Road, Brighton, and those travelling from Bournemouth, Southampton and Portsmouth, to Mr. C. G. Brammer, Meter Department, S.E.B., 111, High Street, Portsmouth, in both cases not later than 28th May.

Engineering in Europe

Survey of Current Literature

SHORT-CIRCUIT currents in traction systems may theoretically reach final values of the order of 10^4 to 10^5 A and have initial gradients of 5×10^5 to 5×10^6 A/sec, which explains the great importance of using high-speed circuit breakers for interrupting the current before it can reach really dangerous values. There are essential differences between a.c. and d.c. breaker designs which partly complicate, and partly facilitate, the designer's task in the d.c. case.

The comparatively low voltage the breaker has to deal with and the possibility of letting the arm carrying the moving contacts itself form an element of the tripping mechanism, assist the designer, as there is no problem of insulation comparable to that of the a.c. case with the far higher voltages involved. The holding mechanism may be a magnet, friction coupling, or even a simple catch, while the tripping mechanism will mostly be operated by powerful springs.

In a new circuit breaker the tripping action is controlled by dynamic repulsion between two coaxial coils wound in opposite senses. The arc-chute is also based on a new and very efficient principle of arc-splitting and incorporates a novel design of arc-splitter elements of rail-shape with cooling ducts. The tripping mechanism operates in such a way that the operating time is roughly inversely proportional to the current gradient. Many tests, of which oscillograms are shown, prove that short-circuit currents up to 10,000 A may be broken in rather less than 25 millisecs.—" New High-speed D.C. Circuit-breaker for 3,000 V Traction Purposes," V. Zajic, *Elektrotechnicky Obzor*, Vol. 40, Nos. 15–18, pp. 293–303, August–September, 1951, in Czech.

Bonding and Casting Resin

The resins marketed as " Araldit " are available in a great variety of forms, liquid, powdered, or rods, etc., according to the purpose which they are to serve. This material belongs to the thermosetting ethoxylin resins and is suitable for joining cold work pieces as pieces heated to 130–150 deg C, when it is used in powder form; and also for treating large metal surfaces, metal screens, or glass tissue, for which purposes the " flame-blasting process " is an economic and simple method. Heavy and light metal surfaces to be joined by " Araldit " must be absolutely clean, especially from grease, and are roughened up before the bonding process. After the jointing proper the non-porous film of the resin is carefully hardened and the joints attain a durability comparable with that of welds. Also, the joints are temperature- and weather-resistant (used for heat exchangers, garden furniture, hum-free transformer stamping stacks, etc.). Uses of casting " Araldit " in the electrical industry: insulation of current transformers, joining of metal terminals into steatite sockets, cast-in oil and moisture-proof capacitors, rotor and stator castings for electrical machines.—" Experience on the Various Uses of ' Araldit ' as a Bonding and as a Casting Resin," K. Meyerhaus, *Kunststoffe*, Vol. 41, No. 12, pp. 457–462, December, 1951, in German.

Transformer Short-Circuits

The phenomena consequent upon the short-circuiting of a coil group of a series-parallel-connected transformer winding are of two different kinds: (*a*) those pertaining to the short-circuit itself, and thus mainly affecting the coil group concerned; (*b*) the equalizing processes between the other coil groups, tending to cancel the potential differences set up by the sudden paralleling of these groups owing to the short-circuit, and corresponding to the no-load distribution between non-interconnected groups.

An analysis of the problem shows that it is not difficult to write down the system of equations from which all the required values could be calculated, were it but possible to determine the impedances and leakage reactances of the windings and their constituent coil groups; yet especially the distribution of the leakage reactances on the individual coil groups, necessary for the determination of the impedances of the

groups on short-circuit, cannot be found by mathematical means. However, a qualitative insight into the process is gained, and the physical picture obtained shows clearly that a coil-group short-circuit dissects, as it were, the transformer into two or more part-transformers in parallel connection, with obviously considerably changed voltage ratios.

If applied to an existing transformer, the mathematical apparatus is useful because the parameters required could be found, at least approximately, by measurement, and the short-circuit currents and their distribution could then be estimated.—" Effects of the Short-Circuit of a Coil Group of Transformer Windings in Series-Parallel Connection," H. Rösch, *E.T.Z.*, Vol. 72, pp. 711–713, 15th December, 1951, in German.

Insulator Deposits

The low values to which the breakdown voltage of high-voltage insulators on which are extraneous deposits may drop cannot be explained only by the presence of an electric field. Experiments with different kinds of moisture deposits (continuous, regionally continuous, and droplet) showed that very different kinds of pre-discharges and main discharges may be obtained, e.g. glow discharges with a running cathode-spot, diffuse glow discharges, and transverse glow-arcs. The last two types belong to the so-called drying discharges, preceding the main discharge which carries far higher currents.

Even more interesting is the fact that the surface condition of a thin water film on an insulator largely determines the level of the eventual breakdown voltage. In one case " grooving " of the film surface reduced the breakdown voltage to 11 per cent of the value for the dry insulator. The mode of breakdown is then of the thermal ionization type instead of the usual collision ionization characteristic of the genuine breakdown in air. Increased breakdown strength of high-voltage insulators can thus be obtained by influencing the character of the pre-discharges, they being unavoidable under certain conditions, but need not necessarily lead to full breakdown, or a " main " discharge. The insulator shape should counteract the effects of the surface tension of water deposits and those of dust accumulations on the intended " favourable " structure and geometry of water films.—" The High-Voltage Insulator as a Problem of Extraneous Deposits," W. Estorf and H. v. Cron, *E.T.Z.*, Vol. 73, No. 3, pp. 57–62, 1st February, 1952, in German.

Transformer Losses

When designing a transformer it is possible to vary the ratio of no-load to short-circuit losses while keeping the electric and magnetic stresses and the total losses constant. This loss ratio becomes most favourable when it reduces the annual running costs, including amortization, of the transformer to the minimum. Such an economic optimum ratio may be determined from actual iron and copper costs (multiplied by a factor which takes into account man-hours) as well as energy and running costs calculated from the " load factor."

A suitable representation of the loading is the " ordered annual load curve " obtained by summation of the daily load curves. The relation between this curve and the load factor m, being the ratio of the average output during the actual working hours of the transformer to the maximum load, is given by Junge's formula: $N = N_{max} [1 - (1 - m^2) (h/H)^m]$, known as the " symbolic annual load curve," where H is the annual hours of operation.

The second relation required is that given by Arnold for no-load and short-circuit losses for stampings of a known loss figure, at constant current density and flux density, whatever the ratio of no-load to short-circuit losses: $N_{no\text{-}load} \; N_{s.c.}{}^3 = \text{const.}$ Evaluation of these two relations shows that the economic optimum ratio for load factors between 0·2 and 1 is below 0·25, preferably 0·20, which means substantial saving of iron.—" Economic Separation of Losses in Transformers," W. Schick, *E.T.Z.*, Vol. 73, No. 1, pp. 14–15, 1st January, 1952, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—*Editors, Electrical Review.*

Belgian Railway Electrification

WORK is now in progress, states the *Railway Review*, on the electrification of a further 415 km of railway lines in Belgium, including the routes from Brussels to Liège, Ostend and Namur and a 6-track section linking the Nord and Midi stations in the capital.

Commerce and Industry

A.S.E.E. Conference

Broadcasting Committee's Report

LAST Saturday the Association of Supervising Electrical Engineers held its annual conference at the Bonnington Hotel, London. In the course of his address Mr. W. F. Parker, M.I.E.E., chairman of the Association, surveyed the past year's activities and mentioned particularly the A.S.E.E. guide to the 12th edition of the I.E.E. Regulations, the production of the Association's first year book, and the electrical exhibition held in March. He referred to the Executive Committee's decision to encourage the entry of technicians into the Association and thus expand its educational work.

After a survey of conditions in industry, Mr. Parker turned to the role of the electrical supervisor. He said that the supervisor's work in many directions—technical, administrative, planning, control of staff, etc.—was becoming more and more important. His practical knowledge covered a wide range which fitted him to co-ordinate the work of operatives and management and act as liaison between them.

The A.S.E.E. gave advice on all matters affecting supervising engineers, provided financial aid and assistance to the membership and offered an educational programme of lectures, works visits, technical library and advice, etc., unequalled by similar bodies and typified by the widely-recognized Swann Diploma scheme.

Future of Broadcasting

The Government's views on the report of the 1949 Broadcasting Committee, with an outline of future policy, are set out in a White Paper (Cmd. 8550, H.M. Stationery Office, 6d). The principal immediate decision is to renew the British Broadcasting Corporation's charter for a period of ten years and proposals for the administration of the service are put forward. The B.B.C. is to receive 85 per cent of the net licence revenue for the first three years of the new charter and will be empowered to borrow £10 million for capital expenditure.

Television will remain in the hands of the B.B.C. but the Government has come to the conclusion that "provision should be made to permit some element of competition when the calls on capital resources at present needed for purposes of greater national importance make this feasible."

On technical questions generally and on the development of the B.B.C. television service the Government will seek the advice of an advisory committee which will also be asked to consider the best methods of higher frequency sound broadcasting.

Visitors to the B.I.F.

Official figures of the visitors to this year's British Industries Fair, which closed last Friday, show a substantial reduction as compared with last year's attendances. At Castle Bromwich, Birmingham, the total number of visitors was about 195,000 as compared with 227,000 in 1951; the reduction in the number of overseas buyers was 30 per cent and in home buyers 10 per cent. The returns for the London Sections (Olympia and Earls Court) gave a total attendance of 11,593 overseas and 44,477 home buyers, reductions of 25 per cent and 30 per cent, respectively, as compared with last year.

It has been announced that next year's Fair will be held from 27th April to 8th May.

Large Railway Load

On Sundays 11th May to 1st June inclusive, the 135 ton stator of a 60 MW generator over 20ft long, 12ft wide and 12ft high is being transported over the lines of British Railways, as an out-of-gauge load, by special train. The stator will take eight weeks to travel from the Heaton Junction, Newcastle, works of C. A. Parsons & Co., Ltd., to Littlebrook power station, Dartford, Kent. The load will travel by daylight as far as possible and on the main line throughout. The train will not exceed 10 miles per hour at any stage and special arrangements have been made to ensure that there will be no disorganization of other traffic while the stator is moving.

Claim for Loss of Bull

The May issue of the *Southern Farmer* (Cranleigh) reports the settlement by the South Eastern Electricity Board of a claim made by a farmer (Mr. A. Charman) for the loss of a bull. In August, 1950, it was killed when its tethering chain made contact with the earth wire of a pole transformer on the owner's farm. The South Eastern Board disclaimed responsibility, contending that the cause of the bull's death was a leakage in Mr. Charman's own installation. Later, however, the Board put in a new earthing

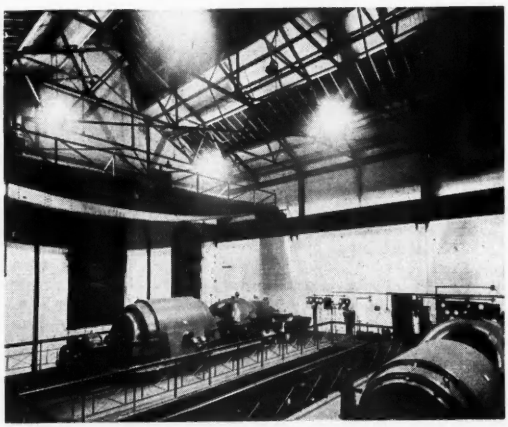
system. Mr. Charman reported the matter to his branch of the National Farmers' Union which was reluctant to back his claim. He called in Mr. R. E. Bristow, M.I.E.E., who, after inspection, advised him to proceed with his claim against the Board. The case was to have come before Horsham County Court on 24th April but at the last minute the Board agreed to pay Mr. Charman 95 guineas and costs.

Smoke Abatement

The 1952 Year Book of the National Smoke Abatement Society contains, in addition to a review of the Society's activities, a good deal of general information on smoke abatement and covers such matters as the law relating to smoke, the Alkali, etc., Works Regulation Act, the Simon Report on Domestic Fuel Policy and the work of the Fuel Research Organization of the D.S.I.R.

Power Station Lighting

The lighting installation in the turbine house at Oxford generating station is the first to utilize a new G.E.C. fitting (No. I.E. 42264A) designed to blend tungsten and mercury lighting to the best advantage. A mercury lamp (250 W or 400 W) and a tungsten lamp (500 W, 750 W, or 1,000 W) are both accommodated in a single fitting. Two considerations have influenced the General Electric Co., Ltd., to introduce this new design. First, the combination of tungsten and mercury lighting gives good colour balance. Second, where high mounting is necessary maintenance economy dictates the employment of a small number of fittings, with the highest possible lumen output each. In the turbine room at Oxford each of the new fittings houses a 250 W mercury lamp and a 500 W tungsten lamp. Although they are mounted on the roof trusses at a height of 35ft in a 96ft by 54ft room, only six fittings were needed to give an illumination of 11 lumens per sq ft at turbine floor level. Although this is the only lighting and all the light sources are overhead, the vertical surfaces of meters and plant are well illuminated even when the travelling crane is stopped immediately beneath two fittings.



G.E.C. combined mercury and tungsten fittings in the turbine room at Oxford generating station

World Trade Centre

Mr. Leland W. Cutler, chairman of the San Francisco World Trade Centre Authority, was entertained to luncheon last week by the American Chamber of Commerce in London, and afterwards held a Press conference at which he outlined the scheme for the establishment of the World Trade Centre. Mr. Cutler has already made a world-wide tour in connection with the scheme and he said that the response in this country had been very encouraging.

The Centre had been sponsored by the State of California with the object of expanding world trade and $100 million had been allocated for this purpose. The Centre would be a permanent building in which would be displayed goods of all kinds from every part of the world. It was intended to call for bids for the construction of the Centre later this year, and it was anticipated that it would open at the beginning of 1954.

Indian Contractors' Protest

The practice of the Bombay Public Works Department of giving contractors' licences to electricity supply undertakings is regarded as an "anachronism" by the *Indian Electrical Contractor and Trader*. This journal (the official organ of the Electrical Contractors' Association, Bombay) says that a number of supply undertakings "support the healthy growth of independent electrical contracting to have the benefits enjoyed by as large a number of consumers as possible."

On the other hand complaints are being received that the authorities at certain places are "misusing the privileges they enjoy as supply undertakers."

> "In a recent complaint it was found that a certain supply undertaking not only delayed connection, but insisted that the wiring done by a licensed electrical contractor should be completely stripped off, so that the undertaking might re-do the work as licensed electrical

contractors before the consumer could get supplies . . . The Licensing Board should investigate and give protection to the consumer as well as the contractor from the unscrupulous underhandings who play the double role of electrical wholesalers and electrical contractors. It will also be worth while to probe into the obstructionist tactics alleged to be employed by certain supply organizations against the legitimate activities of licensed electrical contractors."

Industrial Safety

Over 600 delegates attended this year's National Industrial Safety Conference organized by the Industrial Safety Division of the Royal Society for the Prevention of Accidents at Scarborough from 16th to 18th May. On the opening night, the delegates were welcomed by the Mayor of Scarborough, and after an address by Lord Llewellin, P.C., president of the Society, Dr. W. G. Hiscock, B.Sc., Ph.D., F.R.I.C., F.I.I.A., managing director, Imperial Smelting Corporation, Ltd., presented the opening paper on "Accident Prevention in the Future."

Other speakers were Mr. C. R. Wynne-Roberts (British Institute of Management), who spoke on the "Safe Handling of Materials"; Mr. R. N. LeFevre (North Thames Gas Board), who spoke on "Training and Lecture Techniques"; Mr. H. E. Phillips (Vauxhall Motors, Ltd.), who dealt with "The Contractor *vis à vis* Occupier"; Mr. H. M. Page (assisted by Mr. A. H. Long) (National Oil Refineries, Ltd.), who spoke on "Permit to Work Systems"; and Dr. F. C. Harper (Building Research Station), whose title was "Slippery Floors."

Gas Turbine Courses

Three special short courses are to be held this summer at the School of Gas Turbine Technology at Farnborough. Each of these courses will be concerned with one gas turbine component and a whole week will be devoted to a detailed treatment of its design. The first course (30th June to 4th July) will deal with the theory and design of compressors, while the second (7th–11th July) will be concerned with combustion and the design of heat exchangers. The final course (14th–18th July) will be devoted to the theory and design of turbines. Further details are available from Power Jets (Research and Development), Ltd., School of Gas Turbine Technology, Farnborough Place, Farnborough, Hants.

Switch-house Explosion

Four men were killed and five injured, one seriously, as a result of an explosion in a switch-house of the South West Scotland Electricity Board at Kilmarnock at midday on Sunday. Mr. A. E. Roots, sub-area manager, said that a switch immersed in a tank containing light oil exploded and blew oil from the tank. The oil caught fire. Apparently the original fault was the collapse of a line at a village two miles from Kilmarnock. The switch was designed to clear that fault but another fault must have developed in the switch itself. The supply was restored to most of the area affected by the evening.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £154 0s 0d
COPPER, H.C. Electro	ton £231 0s 0d
Fire Refined 99·70 per cent ..	ton £228 10s 0d
Fire Refined 99·50 per cent ..	ton £228 0s 0d
COPPER Tubes	lb 2s 2½d
Sheet	ton £285 0s 0d
H.C. wire and strip	ton £258 10s 0d
LEAD, English	ton £132 10s 0d
Foreign	ton £131 0s 0d
MERCURY	flask £73 10s 0d
TIN	ton £967 0s 0d
ZINC, G.O.B. Foreign	ton £190 0s 0d
Electrolytic	ton £194 0s 0d
BRASS Tubes	lb 2s 1½d
Sheet	lb 2s 5½d
Wire	lb 2s 8½d
PHOSPHOR BRONZE	
Wire	lb 3s 8½d
RUBBER, No. 1 R.S.S. spot ..	lb 25d–25½d

Lead Further Reduced

The Ministry of Materials has announced that from 14th May the price of imported good soft pig lead is reduced from £147 to £131 per ton delivered consumers' works.

Solid Fuel Eliminated for Cleanliness

At its new die-block plant at Halesowen, Worcestershire, Walter Somers, Ltd., have, in the interests of cleanliness and economy, eliminated the use of solid fuel, and have installed electric heat-treatment furnaces and re-heating furnaces, and the boiler for space heating is fuelled by oil. The plant is equipped with eight Birlec heat-treatment furnaces.

Glass Fibre Reinforced Plastics

Altogether, eight technical papers were presented at a convention on glass fibre reinforced plastics organized by Fibreglass, Ltd., which was held at Ashorne Hill, Leamington Spa, last week (13th and 14th May). The proceedings were opened by Mr. A. M. Dobson (Fibreglass, Ltd.), who spoke on glass fibre reinforcements for plastic laminates. Dr. V. E. Yarsley then dealt with some of the chemical aspects of contact resins, after which Mr. G. C. Hulbert (Bristol Aeroplane Co., Ltd.) described the applications of glass reinforced plastics in the aircraft industry. Messrs. H. Warburton Hall and G. A. Cellie (Ministry of Supply) followed with a discussion on the service use of glass-fibre laminates and Mr. K. Hyde (Ashdowns, Ltd.) continued by dealing with "Fibreglass" based laminates for electrical applications. The relationship between the composition, structure

and physical properties of glass were then explained by Mr. H. Cole (Pilkington Bros., Ltd.), and the convention was concluded by Mr. C. E. Bacon (Owens-Corning Fiberglas Corporation), who spoke on the applications and manufacture of reinforced plastics in the United States.

Trade Announcements

The Kingston branch of **Halsey's Electric Co., Ltd.**, has moved to 35, St. James Road, Kingston-on-Thames (telephone: Kingston 6787).

From Monday next the address of **Duralectrics, Ltd.**, will be Britannia Works, Gainsborough, Lincs (telephone: Gainsborough 2301).

The **National Electrical Supplies Co., Ltd.**, is removing on 26th May to 240-244, King Street, Hammersmith, London, S.W.6 (telephone: Riverside 4655). Premises are being retained at 36-38, Chilton Street, London, W.1 (telephone: Welbeck 0343) and at 13, Chilton Street, W.1 (telephone: Welbeck 7237), which will operate as a West End branch.

The Scottish area sales office of **George Ellison, Ltd.**, has removed to 7, Woodlands Terrace, Glasgow, C.3 (telephone: Douglas 5335).

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the May figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 17th May is deemed to be 134s. The "cost of material" figures are as follows:—

For electrical machinery and equipment: The Board of Trade index figure published on 17th May is 166·3.

For turbo-generating and allied plant: Materials used in mechanical engineering industries, 152·6; blast furnaces and iron and steel melting and rolling (40 and 41), 142·6; price of ⅜in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 16th May) 3s 7½d.

Outstanding contracts covered by the Board of Trade intermediate products index: The index figure for intermediate products (17th May) is 366·6.

International Machine Tool Exhibition

At the International Machine Tool Exhibition which will be held at Olympia, London, from 17th September to 4th October, the countries to be represented will include, in addition to Great Britain, the United States, France, Belgium, Italy, Germany, Switzerland and Scandinavia. Approximately 2,000 machines will be assembled and the exhibition area will cover a floor space of 500,000 sq ft. There will be a service centre for the use of visitors, which will include an information bureau, a free service of interpreters, a stenographers' bureau, and banking facilities. The charge for admission to the exhibition will be 3s 6d. The organizers are the Machine Tool Trades Association.

Ferranti American Tender

The *Manchester Guardian* reports that although the tender of Ferranti, Ltd., for nine transformers for Garrison Dam, Riverdale (North Dakota), was considerably lower than the best American offer, the company has been "unofficially informed" that its tender has been rejected and the lowest American tender—that of the Allis-Chalmers Co.—accepted.

The company had a similar experience two years ago in connection with a contract for the Seattle (Washington) city authorities.

Catalogues and Lists

Gilby-Brunton, Ltd., Seamill, Musselburgh, Scotland.—Forty-page handbook on resistance wires including current temperature characteristics.

Electrical Remote Control Co., Ltd., 13 & 15, Evanston Avenue, Highams Park, London, E.4.—Technical list on tilting mercury tube relays type TMT (95).

Houchin, Ltd., Garford Street, London, E.14.—Three brochures, illustrated in colour, deal with the company's latest range of alternators and complete diesel generating sets, including two new 86 kW and 93 kW units.

Austin Taylor Electrical, Ltd., Ellesmere Street, Failsworth, Manchester.—Priced leaflet describing all forms of cable boxes and glands.

Simpson, Baker & Co., Ltd., 24-30, Gillingham Street, London, S.W.1.—Comprehensive priced and illustrated catalogue of industrial and commercial lighting equipment.

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Tennyson" battery chargers.
"E. & W." billiard table irons.
"Stakon" terminals.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Making Ice Cream

Up-to-date Electric Factory at Ashton-under-Lyne

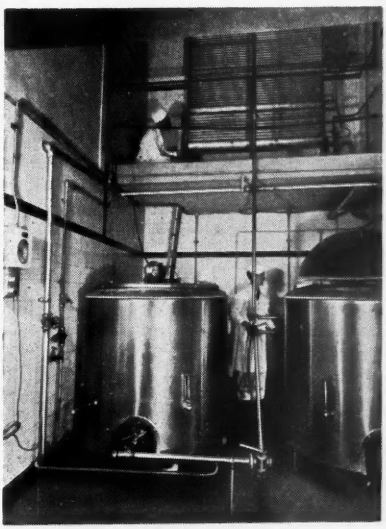
THE increase in the popularity of ice cream in recent years has been remarkable and has been reflected in the great expansion of the industry not only by producers of national scope but also by smaller firms.

A good instance of the progress made by one of these smaller establishments, involving the provision of a most up-to-date electrical installation, is provided at Ashton-under-Lyne by Siddalls Ice Cream Co., Ltd. Purchased in 1946 by Mr. J. T. L. Mallard, now governing director of the company, to supply a small circuit of cinemas, the original plant had a capacity of only 16 gall/hr. The new plant now completed has a capacity of 300 gall/hr, and in addition another plant produces 200 gall of ice lollipops an hour. A fleet of thirteen 25-cwt and 2-ton vans is required to distribute the products within a 30–40 mile radius in East Lancashire.

In the mixing room, where the manufacturing process starts, the ingredients are placed in one of two 200 gall stainless steel mixing tanks. (Almost all the plant is duplicated.) The mixture is steam heated up to about 165 deg F for about ten minutes, being kept agitated the whole time by means of electrically operated paddles. A check is kept on temperature and duration of the treatment by means of an "Accurate" recorder. After being pumped through homogenizers (Creamery Package Co.), in which it is subjected to a pressure of up to 2,000 lb/sq in, the mix goes to the top of a cooler served by a Hall 10 h.p. methyl-chloride compressor.

Leaving the cooler at about 38 deg F, the mix passes into the ageing vats (three of 200 gall capacity each) where it remains up to 24 hr. It is constantly agitated by means of $\frac{1}{3}$ h.p. motors, in readiness for drawing off as required for treatment in the individual freezers. Each of the ageing vats is refrigerated by a separate thermostatically controlled Kelvinator $\frac{3}{4}$ h.p. unit.

Three freezers are available: a 120 gall/hr Vogt unit (Sterne 18 h.p. compressor), a 120 gall/hr Creamery Package unit (Lightfoot 20 h.p. ammonia compressor) and a 60 gall/hr Creamery Package unit (Universal 10 h.p. freon compressor). E.A.C. and Kenbar starters are used for controlling this apparatus. Facilities are provided not only for straightforward extrusion but also for inserting fruit, nuts, etc., into the ice cream. This is done by a special "Fruit Feeder" (Creamery Package Co., Ltd.), which takes the ice cream straight from the continuous freezer and feeds the fruit or nuts at a predetermined rate into the ice cream. In this way, even distribution is achieved. A "Mono" machine fills tubs at a speed of 2,000 per hour, either one or twin flavours in one cup.



Pasteurizing room at Siddalls factory

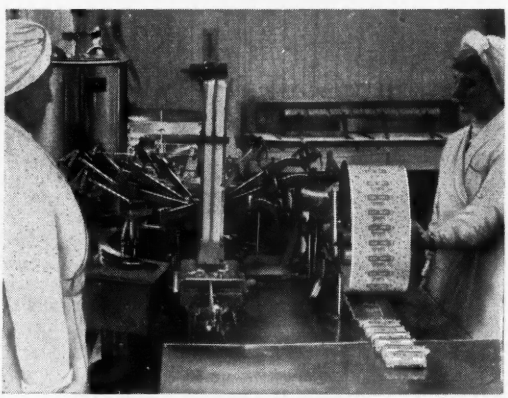
From the freezers the ice cream goes to an S.B. Engineering Company's continuous hardening tunnel where, constantly moving at a rate of 1¼ ft/min, it spends an hour at a temperature of — 44 deg F. The tunnel,

which is 19ft long, 10ft high and 13ft wide and has a capacity of 240 gall/hr, is refrigerated by a Weir ammonia compressor driven by a 50 h.p. Brook motor, a pump with a 1 h.p. Neco motor circulating the liquid ammonia through the surge drum and the coils, and a 30in fan (12 h.p. Brook motor) blowing air through the coils and directing it on to the ice cream by means of baffles. Allen West starters are used for the compressor and fan, with M.E.M. units for the pump and a 1 h.p. 30/1 geared motor driving the conveyor.

Arriving at the discharge end of the hardening tunnel, the slabs of ice cream go either to brick cutting and wrapping machines, or to chocolate dippers (Gainsborough Craftsmen), a thermostatically controlled electrically heated boiling pan supplying the melted chocolate for the latter. Each of these machines is driven individually by a ¾ h.p. or 1 h.p. motor.

After wrapping and packing, the finished products are stored until required at a temperature of between 0 and — 5 deg F in four hardening rooms equipped as follows: No. 1, two 5 h.p. Universal compressors; No. 2, two 5 h.p. Kelvinator units; No. 3, 10 h.p. "Coldrator" units; No. 4, two 3 h.p. Lightfoot units. Freon is the refrigerant used for all these compressors except the last for which methyl-chloride is employed.

The rapid growth of the business has been responsible for so many small refrigeration units; if the installation were being replanned a smaller number of larger units would be employed. The ammonia compressor is manually operated but all the rest of the equipment is automatic. All the machines are fitted with safety high pressure cutouts, the smaller units also having low pressure cutouts.



View of the freezing room and (below) the chocolate dipping machine

Equipment of the lollipop factory comprises two large brine tanks (each with two 10 h.p. compressors, Universal in one tank and "Coldrator" in the other), and a 10 h.p. "Coldrator" compressor for the storage room. Special bagging machines were designed by Siddalls and a Collis conveyor is used.

Originally the electrical installation was connected to the l.v. supply, but now the entire factory is supplied by the h.v. network. The transition was carefully planned by the works engineer, and the contractors, Hallams (Electrical Contractors), Ltd., to minimize interference with production.

The main switchboard consists of a 300 A incoming and two 150 A outgoing oil circuit breakers, with drop-down isolation. The outgoing circuit feeds two sub-switchboards and comprises 0·1 sq in paper insulated and armoured cables.

Electric Soil Warming

Economical Application to Cold Glasshouses

By E. C. CLAYDON*

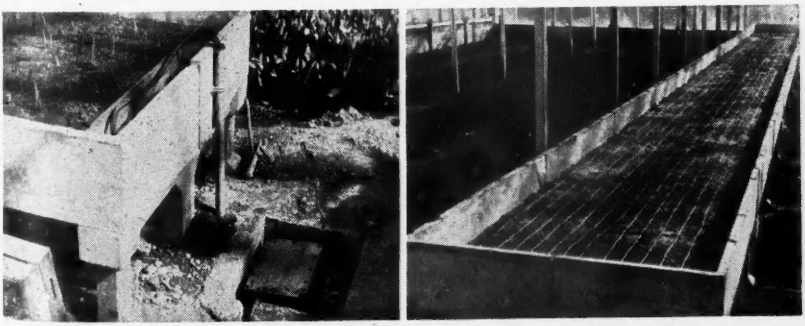
THE present high cost of fuel and heating appliances has resulted in a large number of glasshouses being erected without boilers. The grower is well aware of the limitations imposed by the lack of heating facilities and these nurseries offer a particularly favourable outlet for the installation of electric soil warming equipment. Such installations can be arranged for operation off peak and effect the utmost economy in the use of fuel, since air heating is reduced to negligible proportions.

The electrically warmed propagating bench is familiar and has proved its worth. The hotbed is another application which interests many growers. An installation which can readily be converted from propagating frame to hotbed or even used as a warm enclosure for the protection of tender pot plants has recently been carried out at Read and Procter's nurseries, Hankham, Sussex.

The layout consists of four frames, standing in pairs, each frame being over 60ft long, 5ft wide and consisting of a number of prefabricated concrete sections built in the form of a trough, standing on legs, at a convenient height for working. Arrangements are made for drainage and the dimensions of the frames are such that they can be completely covered by standard Dutch lights.

Soil warming wires are fitted in the base of each frame in the form of series-parallel grids, the loadings being arranged in stages so that the first frame operates at some 10 deg F and the last at 20 deg F above ambient temperature when running continuously. A typical grid consists of sixteen 12 gauge galvanized steel wires connected to angle iron busbars and fed from a G.E.C. 4·5 kVA soil warming transformer situated centrally in a concrete lined pit. The l.v. supply is taken to the grids by means of 19/0·083 single-core v.i.r. cables enclosed, where necessary, in galvanized screwed conduit. The connections are made individually to a busbar fitted to the low voltage terminals of the transformer. The close spacing and low operating temperature of the soil warming wires avoid local overheating and premature drying out of the compost in the frames.

* Agricultural engineer, South Eastern Electricity Board, East Sussex and South West Kent Sub-Area.



Left: **G.E.C. 4.5 kVA transformer in pit, showing connection bar fitted to l.v. terminals and frame being used as a hotbed.** *Right:* **Frame showing soil warming wires in position, as used for warm enclosure**

This system of frames can provide the grower with at least a dozen different arrangements. Covered with lights and with the soil warming wires exposed, the frames can be used as frost-proof or warm enclosures for the protection or growing of tender plants in pots or boxes. If a few inches of compost are placed over the wires, cuttings can be rooted directly and without the need for boxes or other containers. Twenty thousand chrysanthemum cuttings can be accommodated in each frame and the cost of electricity for raising them is approximately £5, or about 1 per cent of the value of the crop.

Filled to a depth of a foot or so, the frames make excellent hotbeds and have been used for such subjects as dwarf beans, carrots, radishes, flowering bulbs and corms. Insulated covers placed over the frames would convert them into suitable enclosures for the forcing of seakale or chicory or the growing of mushrooms.

Apart from the attractively low running costs, the capital outlay for such an installation is very moderate, being under £30 for the four frames, excluding wiring. The scheme described was designed and installed by the South Eastern Electricity Board, East Sussex and South West Kent Sub-Area (manager: Mr. N. Boydell, M.I.E.E. A.M.I.Mech.E.).

DIESEL GENERATING SETS

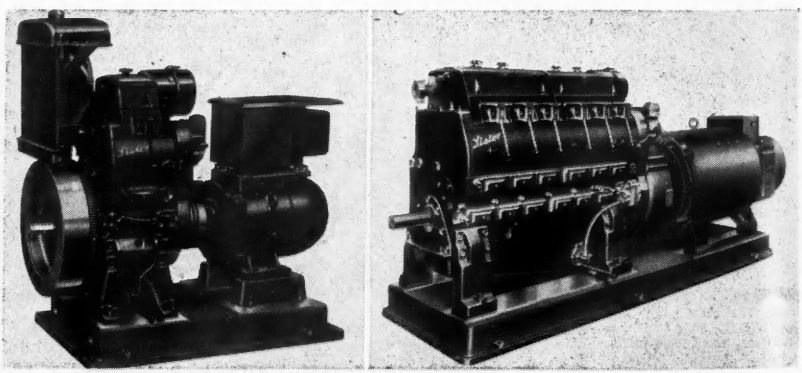
Features of a New Range

A NEW range of diesel engines is now being manufactured by R. A. Lister & Co., Ltd., at Dursley, Gloucestershire, for use as prime movers in all fields of industrial, electrical and agricultural engineering. These "Freedom" engines have been designed to give service under the most arduous conditions and exhaustive tests have established their ability to withstand all climatic conditions.

During the past year sales and service personnel from the Lister overseas organization have visited Dursley to undergo instructors' courses on the "Freedom" engine. It is possible that this is the first time that an engineering firm has set out to train not only its own staff but the mechanics, white and coloured, of users of their engines in all parts of the world. Stocks of spares are already available in all markets.

To achieve efficient quantity production

Lister "Freedom" diesel generating equipment. *Left:* **Single-phase 5 kVA, 230 V, 50 c/s, radiator cooled set arranged for hand starting.** *Right:* **Three-phase 36.2 kVA, 400/230 V, 50 c/s set arranged for tank cooling and with electric starting**



of the "Freedom" range the engine side of the Dursley works has been entirely reorganized. This involved the moving of complete departments from one end of the works to the other and the expenditure of £250,000 on new plant and equipment. The factory is now laid out for batch production on modern lines, the major components being machined in specialized sections, often by the use of high production special-purpose machinery. When work is in full swing the machine-shop will be capable of turning out 1,000 engines a week. The demand for them is already considerable both at home and abroad and it is anticipated that in the near future the production figures will be limited only by the amount of material and labour available.

The "Freedom" series consists of a range of one-, two-, three-, four- and six-cylinder high speed oil engines with running speeds of 1,800 or 1,500 r.p.m. There is maximum interchangeability of parts between engines of all sizes, and unified screw threads are used throughout.

The engines are particularly suitable as prime movers to generating sets, the running speeds of 1,800 and 1,500 r.p.m. corresponding to the synchronous speeds of 60 and 50 c/s alternators respectively. Thus they combine the advantages of direct coupling and the use of alternators in economical frame sizes. At present single-phase generating sets are available with ratings ranging from 5 to 10·6 kVA while three-phase sets are rated at from 16·5 to 36·2 kVA.

The sensitive engine governor, giving a momentary speed variation of 4 per cent and a settled variation of 2 per cent, provides good frequency control. Automatic voltage control is obtained in the case of the single- and twin-cylinder sets by the use of a regulator incorporated in a special housing mounted on the alternator itself. With sets incorporating three-, four- and six-cylinder engines, a self-compensated type of alternator is employed. Thus in all cases external wiring is kept to the minimum and the general "streamlining" of the set maintained.

Although all engines in the range can be hand started under all conditions, 12 V electrical starting equipment with control gear fitted to the engine can be supplied. To permit the set to be stopped from a remote position a solenoid operated fuel cut-off can be provided. Remote control equipment is also available to enable the set to be started and stopped from one or more hand-operated switches, or, alternatively, for completely automatic remote control operation.

Industrial Physics

THE fourth Conference on Industrial Physics arranged by the Institute of Physics will take place in the Royal Technical College, Glasgow, from 24th to 28th June. The subject of the conference is "Physics in the Transport, Shipbuilding and Engineering Industries." In connection with the conference an exhibition of instruments, apparatus and books relative to this subject will be held and more than 70 industrial firms and Government Departments have accepted invitations to take part.

The conference will be opened by Lord Bilsland, president of the Scottish Council, and the principal speakers will include Sir Andrew McCance (who is chairman of the organizing committee of the conference) and Sir Robert Watson-Watt. Further particulars, forms of application for conference membership and tickets of admission to the exhibition may be obtained from the Secretary, Institute of Physics, 47, Belgrave Square, London, S.W.1.

NEXT WEEK'S EVENTS

Monday, 26th May, to Friday, 30th May

EASTBOURNE.—Electrical Trades Union Conference.

Tuesday, 27th May

GLASGOW.—At the Institution of Engineers & Shipbuilders, 39, Elmbank Crescent, 7 p.m. I.E.E. Scottish Centre. Annual general meeting.

LONDON.—At the Royal Society of Tropical Medicine & Hygiene, Manson House, Portland Place, W.1, 6 p.m. Society of Instrument Technology. Annual general meeting. "Recent Advances in the Industrial Use of the Microscope," by E. W. Taylor.

Wednesday, 28th May

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. "Recent Progress in Colour Television Technique in the U.S.A.," by A. G. Jensen.

Waldorf Hotel, Aldwych, W.C.1, 6.30 for 7 p.m. Association of Consulting Engineers. Annual dinner.

Wednesday, 28th May, to Saturday, 31st May

NOTTINGHAM.—Wollaton Park. Bath and West Show.

Wednesday, 28th May, to Saturday, 7th June

PARIS.—Fondation Berthelot, 28, rue Saint Dominique. Conférence Internationale des Grands Réseaux Electriques (C.I.G.B.E.).

ELECTRICITY SUPPLY

Lower Output in April

Merseyside and North Wales Standard Tariffs

A REDUCTION of 4 per cent in electricity generated, compared with the corresponding month last year, is recorded in the Ministry of Fuel and Power statement for April. During that month the British Electricity Authority, the North of Scotland Hydro-Electric Board and the Lochaber Power Co. produced 4,813 million kWh against 5,015 million kWh in April, 1951, a decrease of 202 million kWh. The fact that there were only 24 working days last month against 25 in April last year (when Easter fell in March) no doubt partly accounted for this. The average temperature last month was also somewhat higher than in April, 1951. It is noticeable, however, that the rate of increase in output so far this year is only 3·0 per cent compared with 14·1 per cent in the similar period of 1951. As will be seen from the table below, installed plant capacity has improved by 9·2 per cent since a year ago.

During April the following additional plant was installed in B.E.A. power stations:—Blackwall Point: 30 MW English Electric set. Skelton Grange: 360,000 lb/hr International Combustion boiler. Staythorpe: 60 MW B.T.H. set and 240,000 lb/hr Babcock & Wilcox boiler. Blackburn: 150,000 lb/hr Simon Carves boiler.

Garry-Moriston Transmission Lines

A scheme, prepared by the North of Scotland Hydro-Electric Board, for the transmission of electricity from the power stations at Garry and Moriston to a transforming station to be erected at Fort Augustus, where they will be connected up with the Board's grid system, has been confirmed by the Secretary of State for Scotland. The scheme will also provide power initially for the construction of the Garry and Moriston works. It is estimated to cost £930,000.

South Wales Rural Supplies

The South Wales Electricity Board has a capital expenditure allocation for the next financial year of £2,250,000. This is £450,000 more than that for the current year, but the Consultative Council considers the increase inadequate for expanding farm services, and has decided to ask the Electricity Board to seek a still higher allocation for the following year. A statement of next year's proposed expenditure, presented to the Council in Cardiff last week, revealed that rural developments will be allotted £204,000 as compared with £250,000 for industrial supplies. The rural allocation will enable completion by next March of all three stages of the first programme of the ten-year rural development scheme, costing about £10 million, which was planned two years ago.

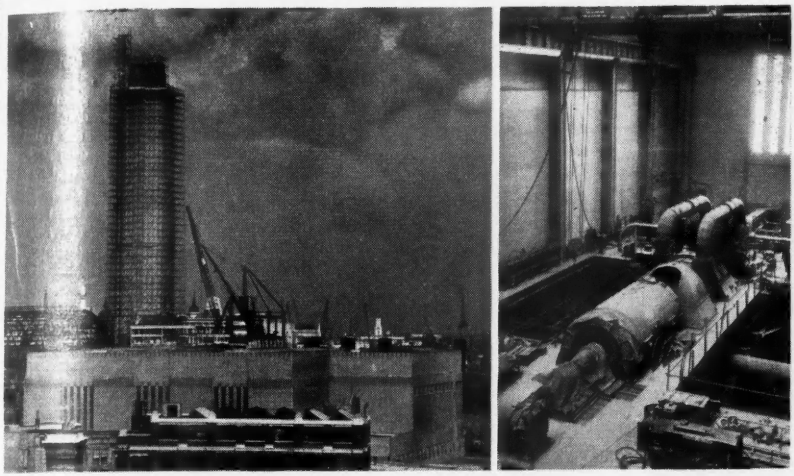
Mr. S. O. Thomas (Carmarthen), a farmer member of the Council, said the allocation was totally inadequate for the developments that the Board had agreed on in the ten-year plan. "We seem to be obsessed with the importance of industry in relation to that of farming and the essential need of increased food production," he added.

Mr. Haydn Lewis (Ammanford) observed that at the present rate of expenditure it would take

ELECTRICITY GENERATED IN APRIL AND PLANT CAPACITY

	Fuel consumed Thousand tons		kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Oil	Steam	Water	Total		
British Electricity Authority ..	2,635	3·8	4,664	20	4,692	4,413	15,904
North of Scotland	10	1·1	12	105	121	121	643
Total for April, 1952	2,645	4·9	4,676	125	4,813	4,534	16,547
Corresponding total for April, 1951	2,861	8·3	4,871	127	5,015	4,735	15,149
Increase or decrease, per cent ..	−7·5	−41·0	−4·0	−1·6	−4·0	−4·2	+9·2
Total for year to date (4 months), 1952	12,452	26·7	21,767	675	22,501	21,242	
Total for corresponding months of 1951	12,503	37·9	21,236	540	21,850	20,661	
Increase or decrease, per cent ..	−0·4	−29·6	+2·5	+25·0	+3·0	+2·8	

* The total includes 7·2 million kWh generated by oil engines and 4·5 million kWh by waste heat plants in April, 1952.



Progress at the new Bankside (London) power station. The left-hand picture, taken from the roof of Dorset House, shows the almost completed single chimney, with four separate shafts, and the rest of the building. On the right is a view of the first of the two initial 60 MW sets

at least 25 years for the scheme to be completed. Essential food production would be given a tremendous boost if the necessary electricity supplies were available.

The chairman, Alderman A. E. Gough, pointed out that in the last four or five years the proportion of farms electrified in South Wales had increased from 9 to 13 per cent and in some places it was as high as 60 per cent.

Southern Consultative Council

The Southern Electricity Consultative Council met in Oxford on 14th May. The chairman (Mr. A. Lockwood) reported that the resolution passed by the Council in January, recommending that in the present financial year a fair proportion of the capital for new business should be allotted to agricultural development, including farm workers' cottages, had been accepted by the Board. Mr. Nimmo, chairman of the Board, pointed out, however, that there were very substantial arrears of work and it would be impossible to offer early completion dates for schemes which might be authorized in the current year.

Of the several inquiries and complaints which were brought before the Council one related to a firm whose private plant had broken down, thus resulting in a higher maximum demand on the Board's system. The firm said that, at the request of the Southern Regional Board for Industry, this private plant had been run continuously, for which it was not designed, and had broken down on two occasions in consequence, and in their view the Electricity Board should come to a compromise with them over payment. The Council asked that before a decision be taken the exact instructions given by the Regional Board for Industry should be considered. Two other complaints concerned the standard domestic tariff as applied to large vicarages; it was decided that the Council would raise the matter of large houses if and when an alteration to the tariff was considered necessary.

The next meeting of the Council is to take place in Bournemouth on 15th July.

Indian Electricity Boards

The Government of India has extended until 31st March, 1953, the time in which, under the Electricity (Supply) Act, 1948, State Governments are to set up Electricity Boards.

Power Control in the Potteries

A somewhat unusual site for a British Insulated Callender's light welded radio mast is seen in the illustration on p. 1142. The v.h.f. radio equipment associated with this mast is of Pye manufacture and the installation is primarily designed for mains operational work and electricity consumers' service. The equipment is controlled from the B.E.A. system operations control centre at Hanley, Stoke-on-Trent, by a P.O. land line. The mast is mounted on the old windmill at Werrington, which houses the transmitter together with the

Light welded 40ft radio mast on an old windmill at Werrington, Stoke-on-Trent

main and stand-by power equipment. Provision has been made for equipping the station with a short-wave radio link as stand-by to the P.O. line.

Glasgow System Reinforcement

In 1949 the South West Scotland Electricity Board approved a scheme for the reinforcement of the 33 kV network in the southern district of Glasgow at a cost of £821,000. This was based on the transfer of the supply load in that district from Dalmarnock generating station to the new station at Braehead, near Renfrew. This scheme did not cover any consequential modifications to the 6·6 kV system and the Board has now decided to carry out these modifications in the area supplied by the 132/33 kV substation at Govan. It involves the construction of a 33/6·6 kV substation at the shipyard of the Fairfield Shipbuilding & Engineering Co., Ltd., and the provision of new equipment at five other substations in the vicinity.

Standard Tariffs

Last October the Merseyside and North Wales Electricity Board introduced a standard domestic tariff to replace the 147 varying prices and methods of charge which existed previously. It now proposes to introduce standard tariffs for commercial and industrial premises; at present there are 300 existing tariffs applicable to such premises in operation throughout the Board's area, and it is proposed to reduce these to eight. The new charges are planned to be brought into effect following the first normal meter reading on or after 1st July.

Brief details of the tariffs are given below. The annual chargeable maximum demand may be the greater of either the highest monthly m.d., October to March, in any year of account or two-thirds of the highest monthly m.d. in any other month. Where the consumer shows that the m.d. between October and March may be expected to be outside the hours 7 a.m. to 7 p.m., Monday to Friday, the annual chargeable m.d. will be the greater of either the highest monthly m.d. between those hours or two-thirds of the highest m.d. at any other time. Tariffs 5-8 include provision for a charge for magnetizing kVAr of demand in certain circumstances.

No. 1. GENERAL TARIFF FOR ALL COMMERCIAL AND INDUSTRIAL PURPOSES, INCLUDING COMBINED COMMERCIAL AND DOMESTIC: 4½d/kWh.

No. 2. BLOCK RATE FOR SINGLE-PHASE SUPPLIES TO SMALL RETAIL SHOPS, COMBINED WITH PRIVATE HOUSES, COMMERCIAL LOAD NOT EXCEEDING 5 kW: First block (100 kWh a quarter for shop and appropriate block for domestic portion), 4½d/kWh; additional consumption at 1d/kWh.

No. 3. BLOCK RATE FOR SINGLE-PHASE M.V. SUPPLIES: (*a*) 4½d/kWh for first 150 kWh a quarter, 2d/kWh for next 1,500, 1½d/kWh for next 1,500, and then 1d: or (*b*) 4½d/kWh for lighting, separately metered, with all other supplies charged at 2d/kWh (first 1,500 kWh), 1½d/kWh (next 1,500), then 1d.

No. 4. VARIABLE BLOCK RATE FOR THREE-PHASE SUPPLIES FROM M.V. NETWORK: First block (150 kWh a quarter up to 1,000 W of installed lighting and 10 kWh for each complete 100 W above that amount), 4½d/kWh; second block (2,000 kWh a quarter for up to 15 kW installed load, including lighting and 100 kWh for each complete additional kW), 2d/kWh; thereafter, 1d/kWh.

No. 5. MONTHLY M.D. TARIFF WHERE DEMAND IS NOT LESS THAN 20 kW: 15s/kW a month for m.d. in each of the months October–March and 10s/kW for m.d. in other months. For all electricity supplied, 0·65d/kWh, subject to fuel price adjustment (0·0008d/1d variation in fuel cost per ton; basic figure £1 18s).

No. 6. ANNUAL M.D. TARIFF WHERE DEMAND IS NOT LESS THAN 20 kW: £6 10s/kW of chargeable m.d. a year. For first 3,000 kWh a year per kW of chargeable m.d., 0·65d/kWh, thereafter 0·6d/kWh, subject to fuel price adjustment.

No. 7. ANNUAL M.D. TARIFF FOR M.V. SUPPLIES WHERE DEMAND IS NOT LESS THAN 20 kW AND WITH TRANSFORMER CHAMBER PROVIDED BY CONSUMER ON OWN PREMISES: First 200 kW of chargeable m.d., £6/kW, and all in excess £5 10s/kW. For first 3,000 kWh/kW of m.d., 0·55d/kWh; for next 3,000, 0·50d/kWh; and thereafter, 0·475d/kWh, subject to coal clause.

No. 8. ANNUAL M.D. TARIFF FOR CONSUMERS WITH DEMAND NOT LESS THAN 20 kW, AT HIGH VOLTAGE: First 200 kW of m.d., £6/kW; next 300 kW, £5 10s/kW; all in excess, £5 5s/kW. First 3,000 kWh/kW of m.d., 0·525d/kWh, next 3,000, 0·475d/kWh; all in excess, 0·45d/kWh, all subject to coal clause.

I.E.E. Radio Section

AN additional meeting of the Radio Section of the Institution of Electrical Engineers will be held on Wednesday next at the Institution, when Mr. A. G. Jensen, Director of Television Research, Bell Laboratories, U.S.A., will give a lecture on "Recent Progress in Colour Television Technique in the U.S.A."

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Lancashire Dynamo Holdings, Ltd.—The accounts of this company for 1951 were reviewed in our issue of 25th April. In his statement issued with the report and accounts, Mr. H. W. Bosworth (chairman) says that the value of stocks and work-in-progress presents a problem. This latter item has increased by over £500,000 in the past year and in addition it is necessary to maintain and extend factories, renew machinery and spend considerable sums on research and development. In the past, expansion has been largely financed by ploughing back the greater part of their profits into the business, but this is no longer possible. Bank overdrafts are not a proper substitute for permanent capital, and if present conditions continue, the board will before long have either to raise more permanent capital or restrict the operations of the company in line with its present capital structure. The current year has started with a record value of unexecuted orders upon their books; whether import licensing and credit restrictions will prevent them from completing and shipping the orders obtained he cannot tell, but delays in obtaining permits to ship are already creating serious problems in their works. He believes that the end of the sellers' market, already obvious in textiles, is now approaching in the engineering industry and that competition with other manufacturing nations will intensify. The company employs about 4,000 people in factories and offices in various parts of the world. Nine subsidiary companies are wholly owned and ten factories are operated in England; three associated companies carry on manufacture in England, Canada and Africa.

The Chloride Electrical Storage Co., Ltd.—In his statement, which is issued with the report and accounts for 1951, Mr. A. W. Browne (chairman) reminds stockholders that the company is a holding concern and that the manufacturing and trading activities are carried out by its subsidiaries. All sections of their business for both home and export markets have contributed to the 26 per cent increase in turnover, which creates a new record. During the first half of the year the demand for their products was considerably in excess of production and it was not until the last three months of the year that it was possible to catch up with the "back-log" of orders. Export sales have continued to expand, particularly in South Africa, India and Singapore, with the result that there has been an increase of 50 per cent in value over the previous year.

The future of their export business is somewhat precarious because there is increasing pressure for local industrialization particularly within the Commonwealth. There is also severe competition growing up from Germany and Japan. In order to overcome import tariffs, the company is to expand the production facilities of the factory in India and to erect a factory in South Africa. The factory extensions in Australia and New Zealand are now nearing completion. During the past five years new plant and equipment of a capital nature have been installed by their manufacturing companies to the extent of £1,675,000 all of which has been found out of the resources of their organization and profits have been ploughed back into the business. If prices remain at the present level it may be that it will not be possible to continue to replace fixed assets from the company's own resources. During the past year the technical staff have devoted time to the development of high performance batteries of the stationary and portable types for the operation of switchgear in power stations. A record number of "Keepalite" emergency lighting equipments was installed during the year. To meet Home Office regulations, a sparkless design of switch relay for use with operating theatre lamps has been developed, and in collaboration with the Inspectorate of Factories, a battery and container have been designed for flameproof electric trucks, for use in factories handling inflammable solvents and in explosive factories and oil depots. Motor-car type batteries reached a high level of production during the year. Their research and development departments have been fully occupied during the past year on the design of batteries and their ancillary equipment for special and new applications for Government Departments. To meet the diminishing supply of cedar wood for battery separators a new plastic separator has been developed for which the company holds world-wide patents.

The Ever Ready Co. (Great Britain), Ltd.—The annual meeting will be held on 5th June. In his circulated statement, Mr. E. N. Rowbotham (chairman) says that sales and profits, before taxation, for the year under review again constitute a record. Exports sales show an increase of approximately 90 per cent over the previous year and home sales have also increased. The "Alldry" battery-

operated radio receivers continue to sell well and plans are in hand for increasing the production of these receivers both for the home market and for export. The sales of battery-operated toys have also improved. The extension of their chemical plant is nearing completion.

The Anglo-Portuguese Telephone Co., Ltd.—In his statement accompanying the report and accounts, Sir Alexander Roger (chairman) says that the expansion and development programme and normal maintenance requirements during the year under review have resulted in the shipment of £343,000 of telephone plant from Great Britain, bringing the total for the past five years to well over £1,500,000. The expansion of the company's systems in Lisbon and Oporto has added a further 8,296 stations, bringing the total to 109,193. The main exchange in Oporto (Picaria) has been converted to automatic operation. The time is shortly arriving when it will be desirable to refund loans from the Telephone & General Trust, Ltd., and provide additional capital. It is proposed at the annual meeting on 5th June to create an additional 1,000,000 ordinary shares which will be available for issue when required.

The Automatic Telephone & Electric Co., Ltd., reports a group profit, before taxation, of £1,545,399 for 1951, as compared with £1,526,689 for 1950. Taxation absorbs £834,049, leaving a net profit of £711,350 (against £714,268), of which £710,530 is attributable to the holding company. After making allocations to various reserves, it is proposed to pay a further ordinary dividend of 12 per cent, making 15 per cent for the year (same), and a dividend for the year of 15 per cent (same) on the deferred stock. The balance carried forward is £451,659 (against £341,312 brought in).

Hopkinsons, Ltd.—In his circulated statement, Mr. R. L. Brown (chairman and managing director) said that a record output had been achieved during the past year in spite of the difficult material supply position during the latter part of the year. Export orders received showed a gratifying increase. The machine shop building had now been completed and now awaited machine tools, the delivery of which was so extended that it would be some time before the full benefits from increased production capacity could be realized.

The British Oxygen Co., Ltd.—Speaking at the annual meeting held on 15th May, Mr. J. S. Hutchison (chairman), in reviewing the group's activities during the year, said that Quasi-Arc, Ltd., had a satisfactory year in the output of electrodes. The purchase during the year of a controlling interest in Fusarc, Ltd., would enable them to push forward the development of the automatic welding side more rapidly.

Vent-Axia, Ltd., reports a profit for the year to 31st March (subject to audit) of £105,559, before taxation of £66,097 as compared with £78,751 for the preceding year. General reserve receives £20,000, and the dividend for the year is maintained at 62½ per cent by a final payment of 37½ per cent.

Holophane, Ltd., has declared an interim dividend of 7½ per cent (same) on larger capital.

Increases of Capital

Magnetic & Electrical Alloys, Ltd.—Increased by £50,000, in £1 ordinary shares, beyond the registered capital of £50,000.

Bakelite, Ltd.—Increased by £1,000,000, in 10s ordinary shares, beyond the registered capital of £1,000,000.

Bankruptcies

D. G. Edwards, carrying on business at 8, Blackfriars Road, Newcastle-under-Lyme, electrical engineer.—Receiving order made 14th May on debtor's own petition.

H. Cooke, carrying on business as Western Wireless, at 33, Fisherton Street, Salisbury, wireless and electrical engineer.—Last day for receiving proofs for dividend 31st May. Trustee, Mr. W. H. Meredith, 54, Endless Street, Salisbury, Official Receiver.

J. R. Short, c/o 23, Primrose Street, South Hylton, near Sunderland, formerly carrying on business at 11, Rutland Avenue, Bishop Auckland, Durham, electrical contractor.—Last day for receiving proofs for dividend 31st May. Trustee, Mr. R. F. Howe, Gibb Chambers, 54, Westgate Road, Newcastle-upon-Tyne, Official Receiver.

F. A. Walmsley, carrying on business at 48, Wyle Cop, Shrewsbury, Salop, electrical contractor.—First and final dividend of 11⅝d in the £, payable 28th May at the Official Receiver's office, 12, Lonsdale Street, Stoke-on-Trent.

J. Henderson, 17, Grenville Terrace, Redcar, Yorks, lately residing and carrying on business at 82a, Galgate, Barnard Castle, electrician.—Supplemental dividend of 1¾d in the £, payable 6th June at the Official Receiver's offices, 4, Bridge Road, Stockton-on-Tees.

J. Robertson, 68, Arran Road, Catford, London, electrical engineer.—Application for discharge to be heard on 19th June at the County Court, Scarbrook Road, Croydon.

J. V. Barke, 21, Circular Drive, Chester, electrical engineer.—Trustee, Mr. S. O. Henry, 5, Rumford Place, Chapel Street, Liverpool, appointed 9th May, 1952.

STOCKS and SHARES

For consistency of dividends, not many ordinary shares can compare with those of the companies in the Telephone and General Trust group. As Sir Alexander Roger explains in his review circulated with the Anglo-Portuguese Telephone Company's report, the parent Trust provides initial finance for the members of the group (which includes Telephone Properties). Loans raised in this way by Anglo-Portuguese have reached £250,000, and, with payment due also for the latest addition to plant and equipment, the time is coming to fund the loan, and to provide additional capital. As a first step in these directions, the company is to propose, at next month's annual meeting, an increase in the authorized capital of a million ordinary shares, to be available for issue when required. Problems confront the expansion of activities, but the chairman points to the line of 8 per cent dividends unbroken for 25 years, many of them very troubled ones. The Telephone and General Trust has a comparable record of 8 per cent dividend, and estimated, at the time of the capital issue a few weeks ago, that this year's profits should again provide an adequate margin over that rate of distribution.

Lancashire Dynamo Capital

The £1 ordinary shares of Lancashire Dynamo Holdings have been unsettled since the references to capital problems contained in the annual report. The balance-sheet shows the growth of stocks and other current assets to have its corollary in the appearance, opposite, of £400,000 bank loans which, says the chairman, are not a proper substitute for permanent capital. He concludes that, if present conditions continue, there will arise the alternatives either of raising more capital in the latter form, or of restricting operations to conform with the company's existing capital structure. This problem, by the way, is thought likely to become a common one in this year's company reports. Taxation is leaving many companies with a shortage of working capital at a time when temporary arrangements may be affected by credit restrictions, and permament financing by doubtful conditions in the new issue market.

Brush Electrical Position

Issued earlier this month, the Brush Electrical Engineering annual report showed a satisfactory outcome to the year's trading, during which turnover reached £24 million, and gave a good account of the further outlook. Net profits were about four times the amount distributed in the 10 per cent ordinary dividend. The financial problems of the group continue, however, to weigh on the market in the shares, the price of which remains only a little above the par value of 5s; the yield of 9½ per cent is well above the average for important industrial investments. In the process of financing very large increases in fixed and current assets, the debt to bankers has more than doubled at £4¼ million, and current liabilities have expanded further. The group's need for fresh capital is evident, says the report, and continues to have the board's closest attention.

Ever Ready Report

For the good figures appearing in the annual accounts of Ever Ready (Great Britain), Ltd., much of the credit goes, according to the report, to a 90 per cent increase in export business. Production facilities for the best-selling manufactures are being expanded. A moderate reaction in the price of the 5s shares, now 24s, may be connected with the reference to the excess profits levy. No figures are given, but it is described as a substantial addition, in its present form, to an already very heavy tax burden. The market recalls that one reason given for the reduction of the ordinary dividend in 1947 to the present rate of 35 per cent, after a succession of 40 per cent payments, was the increase in profits tax imposed at that time; and that the dividend policy has generally been on fairly generous lines. Thanks to last year's expansion, however, both preference and ordinary dividend distributions, costing under £200,000, are covered with some £165,000 to spare. There is, furthermore, an amount of £400,000 standing in the dividend equalization account. Meanwhile, the 5s ordinary shares give a prospective yield of 7¼ per cent, while the 7 per cent preference shares, which are participating, as usual, in a further 3 per cent, stand at 33s 9d to yield a little under 6 per cent.

Price Changes

The new 4¼ per cent British Electricity Stock remains at a shade above the issue price of 99, but there have been fractional declines in some of the Authority's senior issues. In the electrical equipment market, Automatic Telephone & Electric eased off to 56s 3d, despite the maintenance of the dividend at 15 per cent and the disclosure, in the preliminary profits statement, of net group profits very much the same as the previous year's. General Cables ordinary at 17s 6d were also unchanged by news of the proposal to offer new shares to existing holders at 10s in the proportion of one-for-five: "rights" to the issue are worth 1s 3d per share on the present basis. Walsall Conduits and C. A. Parsons have improved, but other changes, although generally insignificant, have been mostly adverse under the lead of G.E.C., A.E.I., Automatic Telephone, Siemens, and English Electric, all of which are about 1s down on the week. Falk, Stadelmann at 35s 6d show a florin loss. Plessey at 17s 6d are 1s to the good.

Electrical Investments

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price May 19 1952	Week's Rise or Fall	Est. Yield p.c.
Gilt-edged and Overseas Stocks			£ s d		
Brit. Elec. 1968/73	3	3	83	−½	3 12 3
Brit. Elec. 1974/77	3	3	82½	—	3 12 9
Brit. Elec. 1976/79	3½	3½	88	−½	3 19 7
Brit. Elec. 1974/79	—	4¼	99	—	4 5 10
Calcutta Elec. ..	6†	6†	20/-	—	6 0 0†
East African Power	7	7	28/3	—	4 19 1
Nigerian Elec. ..	10	10	23/9	—	8 8 6
Palestine Elec."A"	5†	5†	15/6	—	6 9 0†
Perak Hydro-Elec.	Nil	Nil	11/6	—	Nil
Equipment and Manufacturing					
Aberdare Cables(5/-)	20	20	11/-	−3d	9 1 10
Aerialite (1/-) ..	83½	88½	8/3	—	10 14 0
Aron Elec. Ord. ..	15	15	33/9	+1/6	8 17 10
Assoc. Elec. Ord.	20	20	70/6	−1/-	5 13 8
Automatic Tel.& El.	15	15	56/3	−1/6	5 5 8
Babcock & Wilcox	18	18	64/3xd	−1/-	5 12 0
Baldwin, H. J. (2/-)	25	25	4/9	—	10 10 6
British Aluminium	10	12	39/9	−3d	6 0 6
B.I. Callender's ..	7½	9	30/-	−3d	6 0 0
British Thermostat (5/-)	30	30	27/-	—	5 11 1
British Vac.Cleaner (5/-)	25	25	13/9	—	9 1 9
Brook Motors ..	20	20	32/-	—	6 5 0
Brush Ord. (5/-) ..	10	10	5 3xd	—	9 10 6
Burco (5/-) ..	42½	38¾	20/-xd	—	9 13 9
Chloride El.Storage	15	15	60/-	—	5 0 0
Cole, E. K. (5/-) ..	20	25	15/-	−6d	—
Cossor, A. C. (5/-)	Nil	Nil	10/9	−9d	Nil
Crabtree (10/-) ..	17½	17½	32/-	—	5 9 5
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	9/-	—	6 5 0
De La Rue (5/-) ..	50	50	13/9	−9d	9 1 10*
Decca (1/-) ..	112½	112½	16/3	−3d	6 17 9
Dictograph Tel. (2/-)	20	20	5/-	—	8 0 0
E.M.I. (10/-) ..	8	12	14/6	−9d	8 5 6
Electrical Components (5/-) ..	20	20	11/3	—	8 17 10
Elec. Construction	15	15	48/9	—	6 3 0
Enfield Cable Ord.	7½	7½	19/-	−1/6	7 17 10
English Electric ..	15	15	54/6	−1/-	5 10 1
Ericsson Tel. (5/-)	22†	22†	36/-	−2/3d	3 1 0†
Ever Ready (5/-)	35	35	24/-	−9d	7 5 10
Falk Stadelmann	15	15	35/6	−2/-	8 9 0
G.E.C. Ord. ..	17½	22½	78/6	−1/-	5 14 8
General Cables (5/-)	38	30*	17/6	—	8 11 6
Greenwood & Batley	15	15	41/3	—	7 5 0
Hackbridge Cable (5/-)	20	20	10/9	—	9 6 0
HackbridgeHewittic (5/-)	15	18	14/6	—	6 4 2
Hall Tel. Acc. (10/-)	10	10	11/-xd	—	8 13 10
Heatrae (2/-) ..	12½	12½	4/-	—	6 5 0
Henleys (5/-) ..	20	20	17/-	—	5 17 8
Hoover (5/-) ..	37½	35*	24/9	−1/-	7 1 6
Intl. Combustion (5/-)	20	25	21/-	−9d	5 19 0
Johnson & Phillips	15	15	49/6	—	6 1 3

Company	Dividend Previous	Dividend Last	Middle Price May 19 1952	Week's Rise or Fall	Est. Yield p.c.
Equipment and Manufacturing (continued)			£ s d		
Lancashire Dynamo	22½	12½*	40/-xd	−2/3	6 5 0
Laurence,Scott(5/-)	12½	15	13/-	—	5 15 5
London Elec. Wire	10	12½	43/9	—	5 14 8
J. Lucas	17½	7½*	32/-	—	4 13 9
Mather & Platt ..	12½	12½	43/3	—	5 15 6
Metal Industries ..	10	10	36/-	−6d	5 11 1
Mid. Elec. Mfg. ..	15	15	56/3	—	5 6 9
Murex	10	12½	50/-	—	5 0 0
Newman Ind. (2/-)	6	10	2/9	—	7 5 6
Oldham & Son (1/-)	30	30	4/3	—	7 1 3
Parsons, C. A. ..	15	10*	48/9xd	+9d	4 2 0
Plessey (5/-) ..	20	22½	17/6	+1/6	6 8 7
Pye Deferred (5/-)	35	18*	17/6	—	5 2 10
Revo (10/-) ..	27½	27½	36/3	—	7 11 9
Reyrolle	15	10*	44/-	—	4 11 0
Scot. Cable (1/-) ..	30	30	19/9	−3d	6 1 6
Siemens Ord. ..	7½	10	34/6	−1/-	5 16 0
Switchgear & Cowans (5/-)	22½	22½	13/9	—	8 3 9
T.C.C. (10/-) ..	20	20*	46/3	—	4 6 6
T.C. & M. ..	10	10	34/6	—	5 16 0
TelephoneMfg.(5/-)	10	10	8/3	—	6 1 3
Thorn Elec. (5/-)..	20	10*	8/3	—	6 1 3
Tube Investments	25	25	52/-	−3/6	—
Vactric (5/-) ..	Nil	Nil	5/9	—	Nil
Veritys (5/-) ..	Nil	7½	4/-xd	—	9 7 6
Walsall Conduits (4/-)	70	70	48/9	+1/6	5 14 9
Ward & Goldstone (5/-)	44	45*	36/3	—	6 0 0
Watford (2/-) ..	25	25	6/-	—	8 6 8
Westinghouse Brake	14	14	48/9	—	5 14 10
West, Allen (5/-)..	12½	15	11/3xd	—	6 13 4
Trusts, Transport and Communications					
Anglo-Am. Tel.: A Ord.	—	—	82½	−1½	—
Ord.	—	—	55	−3	—
Anglo-Portuguese	8	8	21/3	—	7 10 7
Atlas Elec. ..	3	4	18/-	−3d	4 9 0
Brit. Elec. Traction: Def. Ord. ..	22½	25	405	+10	6 3 5
Cable & Wireless: Ord.	6	8	112½	—	7 2 3
4% Loan ..	4	4	97	—	4 2 6
Calcutta Trams ..	6†	6†	24/-	—	5 0 0†
Cape Elec. Trams	4	5	12/6	—	8 0 0
Globe Tel. & Tel. Ord.	—	—	24/-	+1/-	—
Inter. Tel. & Tel.. .	Nil	15cts	32½	−½	—
Marconi Marine ..	7½	10	28/9	—	6 19 3
Oriental Tel. Ord.	16	16	54/6	—	—
Telephone Props.	7	8	31/3	—	5 2 6*
Tele. Rentals (5/-)	10	10	8/3xd	—	6 1 5

* After capital bonus.
† Dividends are paid free of Income Tax.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Spring Making Machines

THE smallest in the range of "Stewo" Swiss spring making machines available from FRANK WHITTINGHAM, 11–13, Regent Parade, Sutton, Surrey, is suitable for wire up to about 20 s.w.g. It is a universal machine and will produce both tension and compression springs with diameters up to ¾in and can also be tooled to produce springs of special shapes. The maximum wire length which can be dealt with in the standard machine with automatic cut-off is about 16ft. The production rate depends upon the wire length but may be up to 200 or more springs per minute for the smaller sizes.

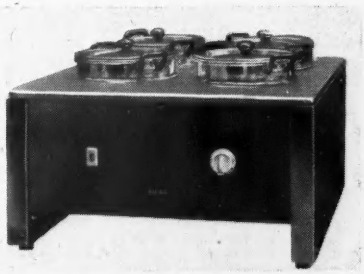
The machine is driven by a 0·5 h.p. motor and the variable speed arrangement gives an adjustment of 1: 2·5 so that production can be speeded up when the types of springs permit. The general design of the machine is simple and straightforward, the working parts being compactly housed in a neat casing. The tooling is carried on the front panel thus enabling setting and adjustment to be carried out quickly and easily.

Welding Transformer

A new single operator oil-cooled welding transformer has been introduced by the QUASI-ARC CO., LTD., Bilston, Staffs. It has a current range of 50/450 A and the current selector roller switches give 79 current settings within this range. The trend in welding has for some years been toward the use of heavier electrodes and this transformer enables electrodes up to $\frac{5}{16}$in in diameter to be deposited speedily and economically. A feature of the unit is that there are 24 input voltage tappings, enabling it to operate from mains supplies ranging from 175 to 550 V.

Counter Service Units

Electrically heated (dry) counter service units which can be supplied in a variety of combinations have just been brought out by the ARORA Co., Rosebery Street, Loughborough. These well-lagged units are robustly constructed with fabricated steel bodies and polished aluminium outer cases; wooden feet are fitted. The 1,750 W elements are of the armoured heavy



Above: **Arora counter service unit**

Left: **Quasi-Arc single operator 450 A welding transformer**

Right: **"Stewo" spring making machine**

duty type and "Simmerstat" control is provided. Typical arrangements are with four 8-pint pots, with two pots and an entrée dish or with two pots and a hot front hob, the weight of a unit with four pots being about 84 lb.

Armoured Cable

The introduction of a new armoured cable combining the properties of lead and armouring in one operation is announced by WANDLESIDE CABLE WORKS, LTD., 106, Garratt Lane, London, S.W.18. The corrugated armoured tube itself will withstand an internal water pressure of 30 lb and because of the lead coating is resistant to corrosion. If it is to be installed in the ground then it will require serving similarly to lead covered and armoured cable. The cable make-up can be as required; a complete range of constructions and insulations, either paper, rubber or plastic, is available. The armoured tubes are from ¼in to 3in bore inclusive and can be either rigid or flexible. As well as lead coated steel for the tube it is also practicable to employ aluminium or copper.

AUSTRALIAN ELECTRICAL TRADE

DETAILED statistics of the external trade of Australia for 1949–50 have now reached this country. Some of the leading electrical imports are shown in the accompanying table with notes of increases or decreases compared with 1948–49. The total value of all electrical imports increased between the two periods by over 40 per cent.

It will be seen that much more generating plant entered the Commonwealth in 1949–50 than in the preceding year and that the United States increased its share of the trade, while Switzerland and Sweden also participated. Imports of telephone material and cable and wire went ahead and came all or mainly from the United Kingdom. On the other hand trade in small motors declined, with loss to the United Kingdom.

The full accounts of Australia's electrical export trade in 1949–50, which show a moderate increase on the previous year, give storage batteries and parts (£A190,000), radio parts (£A149,000), dry batteries and cells (£92,000) and covered cable and wire (£79,000) as the leading items. Noteworthy customers were: New Zealand, New Guinea, Fiji, Malaya and other parts of South East Asia and South and East Africa.

Class of Import	1949–50 £A (000)	Inc. or dec. on 1948–49 £A (000)
A.c. generator sets	62	+ 49
From United Kingdom	8	+ 1
„ *United States*	51	+ 47
D.c. generator sets	275	+ 226
From United Kingdom	84	+ 50
„ *United States*	187	+ 173
Alternators for turbines	719	+ 319
From United Kingdom	674	+ 282
„ *Sweden*	35	+ 35
Other alternators	590	+ 355
From United Kingdom	403	+ 181
„ *United States*	11	—
„ *Switzerland*	172	+ 172
Generators for turbines	4	— 9
Other generators	176	+ 65
From United Kingdom	105	+ 45
„ *United States*	66	+ 29
Other current generating machines	9	— 12
Motors under 1 h.p. except as parts of machines	729	— 582
From United Kingdom	580	— 500
„ *United States*	39	— 31
Motors 1 h.p. and over, a.c. induction (non-commutator) type	1,263	+ 300
From United Kingdom	1,096	+ 341
„ *United States*	85	— 10
Ditto, other	179*	+ 10
D.c. motors, not for lifts or traction	180	+ 51
Storage batteries for motor vehicles including cycles	380*	+ 290
Lighting and power cable, p.i.l.c. and armoured	1,060*	+ 196
Ditto, otherwise insulated	336*	+ 15
Other covered light and power cable	772*	+ 305
Telegraph and telephone cable and wire lead covered and lead, armoured and covered	1,753*	+ 424
Other covered telegraph and telephone cable and wire	326*	+ 165
Enamelled wire	431*	+ 1
Lamps, filament, automobile	200	+ 10
From United Kingdom	115	+ 25
„ *Holland*	46	— 1
Lamps under 20 V, flashlight	16	— 22
Other lamps under 20 V	102	+ 19
Lamps, 20 V and over, gas-filled	71	+ 39
Lamps, 20 V and over, m.f.	86	+ 29
Tubes or bulbs, non-filament	64	— 7
Electric stoves, cookers and the like	360	— 475
Radiators, toasters and kettles	57	— 31
Measuring and recording instruments	322	+ 2
From United Kingdom	273	+ 20
„ *United States*	32	— 19
Telegraph instruments and appliances	150	— 59
From United Kingdom	56	— 62
„ *United States*	93	+ 3
Telephones	912*	+ 161
Telephone switchboards, automatic	1,202	+ 803
From United Kingdom	1,043	+ 645
„ *United States*	151	+ 150
Telephone and telegraph switchboards and appliances n.e.i.	3,673	+ 1,557
From United Kingdom	3,282	+ 1,213
„ *United States*	281	+ 245
Radio valves	265	— 40
Radio receiving sets	62	—
Transmitting sets	14	— 6
Radio parts	125	— 11

* All or mainly from United Kingdom.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 2nd July from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1945

1604. General Electric Co., Ltd., Foot, J. B. L., and Hawes, P. O.—Signalling systems, for example, for remote control purposes. 5th June, 1946. (674743.)

1946

2830. Standard Telephones & Cables, Ltd.—Balanced electronic modulator. 20th September, 1946. (675086.)

1947

7578. Philips Lamps, Ltd.—Manufacture of magnetic materials. 19th March, 1947. (674828.)

11172. Marconi's Wireless Telegraph Co., Ltd., Twatt, J., and McCallion, J.—Suppression control circuit arrangements for signal receivers. 3rd February, 1948. (674830.)

27404. Standard Telephones & Cables, Ltd., Scott, T. R., and Leno, J. A.—Insulated electrical conductors. 8th October, 1948. (674833.)

1948

6131. Radio Corporation of America.—Electron storage devices with grid control action. 27th February, 1948. (674924.) 6132. Electronic discharge devices. 27th February, 1948. (674925.) 6133. Control of electron discharge devices of storage element type. 27th February, 1948. (674926.) 6134. Scanning circuits for electron discharge devices capable of memory storage. 27th February, 1948. (674927.)

10831. Automatic Telephone & Electric Co., Ltd., Irgin, C. R., and Jones, E. W.—Telephone systems. 7th April, 1949. (674840.)

11297. Stromberg-Carlson Co.—Automatic telephone systems. 23rd April, 1948. (675088.)

20841. General Electric Co., Ltd., and Friedlander, E. S.—Electromagnetic torque-producing devices. 20th July, 1949. (674930.) 22188. Alternating current electric motor equipments. 21st July, 1949. (674931.)

25829. Lehmann, F.—Circuit arrangements for electric discharge tubes, more particularly glow discharge tubes. 4th October, 1948. (Cognate application 25830, 9th September, 1948.) (674933.)

29779. Radio Corporation of America.—Methods of, and systems for, obtaining a standard low frequency. 16th November, 1948. (Cognate application 29780, 13th February, 1948.) (674936.)

32011. Noyes, R. C. (Telefonaktiebolaget, L. M. Ericsson).—Apparatus for receiving signals over telephone lines by changing of resistances. 10th December, 1948. Convention date not granted. (674862.)

32836. British Thomson-Houston Co., Ltd.—Automatic electric circuit breakers. 20th December, 1948. (674864.)

33150. British Thomson-Houston Co., Ltd.—Pigmented coating composition. 23rd December, 1948. (674865.)

1949

917. Vaughan, R. C.—Direct current electric motors particularly for driving toys or small models. 29th April, 1949. (674868.)

2410. Western Electric Co., Inc.—Electric signal storage devices. 28th January, 1949. (675094.)

2753. British Thomson-Houston Co., Ltd.—Operating circuits for electric discharge lamps. 1st February, 1949. (674722.)

3693. Philips Electrical, Ltd.—Electromagnetic devices. 10th February, 1949. (Cognate application 3694, 16th October, 1948.) (674874.)

5388. British Thomson-Houston Co., Ltd.—Electric discharge devices. 28th February, 1949. (674878.)

6642. General Electric Co., Ltd., Bell, J., and Wright, D. A.—Gas-filled electric discharge devices. 8th March, 1950. (Cognate application 3804, 14th February, 1950.) (675097.)

8605. Pye, Ltd., Shilling, A. H., and Starnecki, J.—Electric valve holders or the like. 30th March, 1950. (675098.)

9845. Mullard Radio Valve Co., Ltd., Mills, V. R., Popper, P., and Tyrrell, A. J.—Mass spectrographs and like apparatus. 4th July, 1950. (674729.)

11505. C. D. Patents, Ltd.—Electro-chemical electrode. 11th April, 1950. (674731.)

13271. Postmaster General.—Piezo-electric crystals. 3rd May, 1950. (674895.)

13846. Telephone Manufacturing Co., Ltd.—Electrical communication systems. 28th April, 1950. (674735.)

14596. British Thomson-Houston Co., Ltd.—Electric hotplates. 31st May, 1949. (674959.)

14693. Western Electric Co., Inc.—Method of forming on iron or on iron alloy a surface easily wettable by mercury. 1st June, 1949. (674960.)

17297. Boulton Paul Aircraft, Ltd., and Redshaw, S. C.—Electrical resistance type strain gauges. 29th June, 1950. (674740.)

17473. Igranic Electric Co., Ltd.—Electric motor-control apparatus. 1st July, 1949. (674744.)

17572. Ward & Goldstone, Ltd.—Contact-sockets for electric plug-and-socket couplings. 4th October, 1950. (674968.)

17759. Riccomagno, G.—Electric lamps. 5th July, 1949. (674970.)

19538. Driescher, F.—Electrical fusible cut-outs. 25th July, 1949. (674973.)

19827. Electric & Musical Industries, Ltd.—Mosaic screens such as are utilized in television transmission tubes. 25th July, 1950. (674976.)

21015. Standard Telephones & Cables, Ltd., and Beck, A. H. W.—Electron discharge devices. 12th August, 1949. (674758.)

21297. Philips Electrical, Ltd.—Automatic frequency control circuits for electric oscillators. 16th August, 1949. (675105.)

21491. Automatic Coil Winder & Electrical Equipment Co., Ltd., and Wilkins, S. R.—Attenuators. 22nd June, 1950. (675106.)

21497. General Electric Co., Ltd., and Parker, E. L.—Electric couplings of the kind for use between two conductors which are normally co-linear. 18th August, 1950. (675107.)

21619. General Electric Co., Ltd., and Nixon, R. D.—Electric discharge devices of the cathode-ray tube type and apparatus incorporating such devices. 25th August, 1950. (675109.)

22040. English Electric Co., Ltd.—Grid controlled rectifier circuit arrangements. 18th August, 1950. (674985.)

23612. Gilbert, T. J., and Hesketh, J. B. Fermor.—Busbar assemblies and connector units therefor, for electric power distribution. 17th August, 1950. (675111.)

25979. Communications Patents, Ltd.—Wired broadcasting systems. 28th December, 1950. (674767).

25811. British Thomson-Houston Co., Ltd., Stokes, J. A., and Ludbrook, L. C.—Remote position control systems. 6th October, 1950. (675116.)

26390. British Insulated Callender's Cables, Ltd., and Lorch, H. R.—Insulated electric conductors. 13th October, 1950. (674994.)

26925. Hinksman, E. A.—Variable voltage control circuits. 18th October, 1950. (674996.)

28625. Metropolitan-Vickers Electrical Co., Ltd.—Electrical waveguides. 20th September, 1950. (675118.)

29459. General Electric Co., Ltd.—Thermionic valve integrating circuits. 6th November, 1950. (675119.)

30568. Imperial Chemical Industries, Ltd., and Hudson, R. A.—Electric heat sealing of films. 29th November, 1950. (675008.)

33253. Radio Industrie.—Colour and stereoscopic television systems. 29th December, 1949. (675017.)

33295. Ekco-Ensign Electric, Ltd., Evans, J. N. I., and Hewson, W. A.—Fluorescent materials. 29th December, 1950. (675122.)

33377. Radio Corporation of America.—System for stabilizing the frequency of an oscillator. 30th December, 1949. (675123.)

1950

53. National Cash Register Co.—Electronic impulse counters and accumulators. 2nd January, 1950. (675032.)

779. General Electric Co., Ltd., and Watkins, T. B.—Electrical oscillation generators. 11th January, 1951. (675033.)

1316. British Insulated Callender's Cables, Ltd.—Clip for securing electric cables, wiring fittings, and the like to metal girders. 16th January, 1951. Addition to 611338. (675035.)

1466. Automatic Electric Laboratories, Inc.—Time announcing system. 19th January, 1950. (675124.)

1474. British Thomson-Houston Co., Ltd., and Melville, W. S.—Discharge circuits. 19th January, 1950. (675036.)

1562. Western Electric Co., Inc.—Correcting circuits for television transmitter tubes. 20th January, 1950. (674908.)

1989. General Electric Co., Ltd., and Dudley, M. D.—Cathode-ray tubes. 15th December, 1950. (675037.)

2199. Standard Telephones & Cables, Ltd.—Cases for electrical components. 26th January, 1951. Addition to 621903. (675039.)

4307. British Thomson-Houston Co., Ltd. (General Electric Co.).—Plugs for electric busbar duct systems. 20th February, 1950. (675126.)

4337. Webster, C. J., and Anson, W. E.—Electric fuse carriers. 20th February, 1950. (674778.)

4398. Mallory Batteries, Ltd.—Alkaline electric cells. 21st February, 1950. (675044.)

6428. Burkli, O.—Process for manufacturing porous carbon electrodes. 14th March, 1950. (675131.)

8173. Metropolitan-Vickers Electrical Co., Ltd.—Ceramic dielectric material. 31st March, 1950. (675134.)

11453. Zenith Radio Corporation.—Television transmitters. 8th May, 1950. (675061.) 11454. Television receivers. (675062.)

14952. Fox, P. X.—Variable electric resistances, potentiometers, and the like. 27th September, 1950. Addition to 649438. (675070.)

19329. Dietz, M., and Czempiel, F.—Electric motors. 2nd August, 1950. (674788.)

19513. Stackpole Carbon Co.—Double-pole electric snap switches. 4th August, 1950. (674793.)

19681. Erie Resistor Corporation.—Terminal connections for electric condensers having a ceramic or like dielectric. 8th August, 1950. (674791.)

21330. Giambonini, G.—Commutator motor brush holders. 29th August, 1950. (674796.)

22059. Philips Electrical Industries, Ltd.—Double channel radio receivers. 7th September, 1950. (674798.)

23062. Sperry Corporation.—Electrical apparatus for comparing the phases of two alternating voltages. 20th September, 1950. (674802.)

24332. National Research Development Corporation.—Measuring or observing changes in the electrical conductivity of liquids. 5th October, 1950. (675157.)

24502. De Gialluly, E. M. S.—Radio receiving and transmitting apparatus. 6th October, 1950. (674816.)

25800. Hunt, Ltd., A. H.—Manufacture of wound capacitors from metallized dielectrics. 23rd October, 1950. Addition to 595808. (675079.)

27224. Compagnie Industrielle des Téléphones.—Calling and signalling devices in multiple impulse transmission systems. 7th November, 1950. (674811.)

30700. Philips Electrical Industries, Ltd.—Floodlights. 15th December, 1950. (674817.)

30867. Ateliers de Constructions Electriques de Charleroi.—Magnetic recorders. 19th December, 1950. (674818.)

31274. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Device for adjusting a supporting bearing for a moving element of a measuring instrument, such as an electricity meter. 22nd December, 1950. (674819.)

1951

15649. Igranic Electric Co., Ltd.—Thread or web winding systems. 1st July, 1949. Divided out of 674744. (674820.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 14th June :—

COMPENCER. No. B690,590. Class 9. Electrical apparatus and instruments included in Class 9.—Compagnie Générale d'Electro-Céramique, Paris, France. Address for service c/o Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

ASBESTEL. No. 704,007. Class 9. Asbestos-insulated, stainless-steel-sheathed electric conductors or cables.—Pirelli-General Cable Works, Ltd., 343–345, Euston Road, London, N.W.1.

UNIMAC. No. 704,333. Class 9. Electric fuses and electric switches and switchgear.—C. H. Parsons, Ltd., Britannia Works, Wharfdale Road, Tyseley, Birmingham.

TRANSRAD. No. 705,005. Class 9. Electrical apparatus included in Class 9.—Bertrand Zucker, 138A, Cromwell Road, London, S.W.7.

SMITHS. No. 702,023. Class 9. Electric cigar and cigarette lighters; and automobile radio sets, parts and fittings, all included in Class 9.—S. Smith & Sons (England), Ltd., Cricklewood Works, Edgware Road, London, N.W.2.

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CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Altrincham.—30th May. Corporation. Rewiring of electrical installation at the public slaughterhouse. (See this issue.)

Australia.—BRISBANE.—28th May. Queensland State Electricity Commission L.v. power house switchboards for the Mackay City Council. (C.R.E. 17326/52. Ten/3993.)*

MELBOURNE.—10th June. Director of Posts and Telegraphs. Supply of telephone transmitters and parts. (C.R.E. 17677/52. Ten/4001.)* Supply of condensers. (C.R.E. 17753/52. Ten/4013.)*

Belgium.—BRUSSELS.—3rd June. Ministry of Colonies. Supply of telephone cables and accessories for the Belgian Congo. (C.R.E. 17296/52. Ten/4010.)*

Brierley Hill.—30th May. U.D.C. Electrically driven centrifugal sewage pump with automatic control gear at Heathbrook pumping station. Wallheath. R. H. J. Comber, surveyor, Hawbush House, Brettell Lane.

Burton-on-Trent.—18th June. Corporation. Street lighting equipment. (See this issue.)

Ceiriog.—16th June. R.D.C. Installation of electricity in 40 houses and six shops with flats at Rhosywaen, Chirk. R. W. Awbrey, surveyor, The Mount, Chirk.

High Wycombe.—18th June. Corporation. Street lighting equipment. (See this issue.)

Horsham.—6th June. U.D.C. Street lighting equipment. (See this issue.)

New Zealand.—DUNEDIN.—18th June. Corporation. Supply of 6.6 kV, 660 V and 250 V cable. (C.R.E. 17789/52. Ten/4011.)*

Oldbury.—16th June. Corporation. Street lighting equipment. (See this issue.)

Stockport.—10th June. Corporation. Street lighting equipment. (See this issue.)

Turkey.—ANKARA.—1st June. Etibank Genel Mudurlugu. Circuit breakers for Sariyar project. (C.R.E. 17246/52. Ten/3992.)* Supply of disconnecting switches. (C.R.E. 17245/52. Ten/3999.)* 3rd June. Supply of 6.6 kV and 3.3 kV switchgear. (C.R.E. 17249/52. Ten/3998.)*

Wanstead and Woodford.—23rd June. Street lighting equipment. (See this issue.)

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

ORDERS PLACED

Newcastle-under-Lyme. — Corporation. Recommended. Electrical installations in 15 houses and 4 maisonnettes at Earl's Drive (£466). —Midlands Electricity Board.

Southport. Lighting Committee. Recommended. Installation of Class "B" street lamps on the Heathfield road housing sites Nos. 14 and 15 (£1,433).—Metropolitan-Vickers.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Althorpe (Lincs).—Houses (22) for Isle of Axholme R.D.C.; Lonsdale & Hubbard, Ltd., Althorpe.

Andover.—Houses (86), Leigh Road; borough surveyor.

Ashton-under-Lyne.—Shops (10) and flats (16), Crowhill; borough engineer.

Bedale.—Houses (10) for the R.D.C.; H. B. Richardson, architect, 3, Skinnergate, Darlington.

Belfast.—Flats (65) and three shops, Antrim Road and Duncairn Gardens junction; housing architect, 94, Chichester Street.

Beverley.—Houses (60); G. Palfreyman, R.D.C. surveyor, 36, Market Place.

Billingham-on-Tees.—Houses (114) for the U.D.C.; Kitching & Co., architects, 21, Albert Road, Middlesbrough.

Bolton.—Houses (220), Oldhams Farm estate and Padbury Way; borough engineer.

Bromsgrove.—Houses (40), Charford estate, Section 6; R. H. Crump, quantity surveyor, Redditch Road, Alvechurch, Worcs.

Burnley.—Twin operating theatre block, General Hospital; Manchester Regional Hospital Board, Sunlight House, Quay Street, Manchester.

Cardiff.—Laboratory for public analyst, Crofts Street (£14,500); city engineer.

Carlisle.—Works extensions; R. Hind, Ltd., Durranhill Road.

Carlton.—Erection of new grammar school at Barton Road for Notts C.C.; A. G. Clower, Ltd., Daybrook Square, Nottingham.

Chesterfield.—Houses and bungalows (96), Blue Bank estate, Brimington; J. B. Wikeley, R.D.C. surveyor, Saltergate.

Corby.—Shops and flats (30) for Development Corporation; general manager, The Stone House.

Eastbourne.—Houses (38), Langney Village estate; borough surveyor, 2, Saffrons Road.

Enfield.—Nurses' home, Chase Farm Hospital; North East Metropolitan Regional Hospital Board, 3, Queen Anne Street, W.1.

Halesowen.—Houses (20), Howley Grange estate; J. Parkes (Builders), Ltd.

Hatfield.—Flats (45), in four blocks, Longmead; J. H. Parker, architect to R.D.C., 82, Great North Road, Hatfield.

Hazel Grove & Bramhall.—Houses (48), Bosden Fold site; F. Bradley, architect to U.D.C., 4, Wood Street, Bolton.

Hebburn (Co. Durham).—Reconstruction work at Tyne Lead Works for Associated Lead Manufacturers, Ltd.; J. R. Rutherford & Sons, builders, Jesmond, Newcastle-on-Tyne.

Hendon.—Flats (40), Cricklewood Lane, N.W.2.; town clerk, Town Hall, N.W.4.

Hyde.—Factory, offices, etc., on site off Nicholson Road; F. Brine & Sons, butchers, etc.

Ilkeston.—Houses (177), Kirk Hallam estate; Stanton Housing Co., Ltd., Stanton, Ilkeston.

Kent.—Primary schools at Beckenham (3), Dartford (2), Bromley, Sidcup-Chislehurst, Foots Cray; county architect, Springfield, Maidstone.

Leeds.—Secondary modern school, Lidget Lane (£211,626); Butterley Co., Ltd., contractors, Ripley.

Houses for T.C.: Gipton and Seacroft (50); M. Harrison & Co. (Leeds), Ltd. Reuben Street (44) and Moorfield estate (64); West & Son (Leeds), Ltd. Tinshill estate (38); W. J. Simms, Son & Cooke, Ltd., Nottingham.

Leek.—Houses (16), Haregate estate, for U.D.C.; Frost & Co., High Lane, Brown Edge.

Liverpool.—Factory, Kirkby Trading estate; Tubewrights, Ltd., 25, Buckingham Gate, S.W.1.

London.—Holborn.—Flats (64), seven shops and c.d. control centre, Red Lion Square, W.C.1 (£191,553); Allen Fairhead & Sons, contractors, Sydney Road, Enfield.

Loughborough.—Houses, Ashby Road estate; Wm. Corah & Son, Ltd., Pinfold Gate, Loughborough (28) and Wm. Davis & Co. (Leicester), Ltd., 15, Cattle Market, Loughborough (20).

Macclesfield.—New factory for John Morris (Fire Snow), Ltd., Stockport; R. A. Riseley, architect, 24a, Mill Street.

Houses (86), Ladybrook estate; J. H. Dossett, borough surveyor, Town Hall.

Manchester.—Three-storey extension for Associated Technical Manufacturers, Ltd.; Donald McDonald, Ltd., Trafford Bar, Manchester.

Middlesbrough.—Offices, showroom and garage in Douglas Street for Middlesbrough Transport & Eng. Co., Ltd., Borough Road East.

Nantwich.—Agricultural school, Poole Hall, for Cheshire E.C.; county architect, The Castle, Chester.

Newcastle-on-Tyne.—Houses (12), Benton Road; W. Smelt, builder, 125, Westgate Road.

North Shields.—Factory for T. B. Bilton & Sons, Hudson Street; W. Stockdale, architect, 73, Howard Street.

Nottingham.—Houses (120), Fernwood estate; Thos. Bow, 45, Lamartine Street.

Oldham.—Houses (133), Fitton Hall estate; Cameron & Middleton, surveyors, 21, Queen Street.

Ripon & Pateley Bridge.—Houses (30), Summerbridge; W. G. Birch, Ltd., Harrogate.

Sedgefield (Co. Durham).—Houses (413); J. H. Tarran, surveyor, R.D.C. offices.

Sheffield.—Factory at Boston Street for Dyson & Co. (Sheffield), Ltd.; Raine & Stacey, architects, 65, Wolstenholm Road, Sheffield, 7.

Smethwick.—Works extensions; Roberts Cycle Industries, Ltd., Wills Street.

South Shields.—Erection of three-storey flats near River Drive (26,000); Carruthers & Son, builders, 1, Heugh Terrace.

Stockton-on-Tees.—Infants' school, Roseworth estate; borough architect, 28, The Square, Stockton.

Stoke-on-Trent.—Houses at Blurton Farm estate No. 2: J. H. Broadhurst & Son, Ltd. (34); T. Foster & Sons, Ltd. (20); E. Whitney & Co., Ltd. (4); Langley Bros. (4); P. Bailey & Co., Ltd. (20); Morgan Building Co., Ltd. (40); and H. J. Emery, Ltd., Basford (26).

Sunderland.—New St. Cuthbert's R.C. Junior and Infants' School; A. V. Clerey & Son, builders, 14, Frederick Street.

Sutton Coldfield.—Houses (56), Reddicap Heath estate; Industrial Buildings (Birmingham), Ltd., Mere Green Road.

Dwellings, Falcon Lodge estate: Butler Bros. (Birmingham), Ltd., 150, Sutton Road (47 houses); Crossley Bros. (Builders), Ltd., 111, Albert Street, Birmingham (17); and A. E. Jones, 37, Hansons Bridge Road (16).

Wakefield.—Shops and flats, Union Street and Northgate; Ravenseft Properties, Ltd., 16, Charles Street, W.1.

Walsall.—Houses for Borough Council: Gipsy Lane (72); United Construction (Walsall), Ltd. Brockhurst Crescent (54); Rock & Downes, Ltd., Birmingham Road, Aldridge.

Walthamstow.—Flats (52), Courtney Road; Warner Estate, Ltd., Hawarden Road, E.17.

Warwickshire.—Solihull Tudor Grange Boys' Grammar School, Rugby Harris C. of E. Secondary School, workshop block at Mid-Warwickshire School for Further Education (Leamington), Solihull Shirley Heath Junior School, Nuneaton St. Joseph's R.C. Secondary School, Sutton Coldfield Falcon Lodge Junior School, Nuneaton Caldwell Junior School and Solihull Dorridge Junior School (1952-53 programme approved by M. of E.); county architect, Warwick.

Whitley Bay.—Flats in Oaktree Gardens for U.D.C.; E. Roberts, surveyor.

Wollaton.—Textile and fabrics factory; Frymann & Fletcher, Ltd., Clyde Works, Radford.

Wolverhampton.—Erection of Rake Gate Junior School (£66,500); A. & R. Astbury, Ltd., Watling Street, Cannock.

York.—Flats (70), Askham Lane and Moor Lane estate; city architect.